A NAVAL ENCYCLOPÆDIA:

COMPRISING

A DICTIONARY OF NAUTICAL WORDS AND PHRASES; BIOGRAPHICAL NOTICES, AND RECORDS OF NAVAL OFFICERS;

SPECIAL ARTICLES ON NAVAL ART AND SCIENCE,

WRITTEN EXPRESSLY FOR THIS WORK

BY OFFICERS AND OTHERS OF RECOGNIZED AUTHORITY IN THE BRANCHES TREATED BY THEM.

TOGETHER WITH

DESCRIPTIONS OF THE PRINCIPAL NAVAL STATIONS AND SEAPORTS OF THE WORLD.

COMPLETE IN ONE VOLUME.

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PREFACE.

THE great abundance of encyclopædias that distinguishes our day would, at first sight, seem to discourage any attempt to add to that department of literature. But among all the works coming properly under the name of encyclopædia there is not one, at least in the English language, that supplies the want which it is the aim of this volume to meet. The sea is, so to speak, a world in itself. It has its own vegetable and animal life, and its own natural laws; while on its surface floats a multitude of vessels that serve either as the outlying defenses of the nations which border upon it, or as the carriers of the commodities which they find a profit in exchanging. This world of men and things, so peculiar and distinct, necessarily has a peculiar language, peculiar customs, and peculiar belongings. It is, moreover, a progressive world, and the arts and sciences that have relation to it are moving and developing *pari passu* with those that relate solely to the terrene portion of the globe. When to these considerations is added the fact that the sea is the especial field of operations of a profession which unites in itself the characteristics of the sailor and of the soldier, and to which is committed the high trust of maintaining the honor and dignity of the nation which it represents in all parts of the globe, and of extending over the citizens of its own country, wherever their business or pleasure may call them, the protecting ægis of the national flag, it would certainly appear that sufficient warrant exists for the issuing of this work, which has for its object the bringing together in one view, and within convenient compass, the several kinds of information most useful to naval officers, and most likely to be sought for by seafaring men of every name and grade. Nor is it only those that are by profession, or calling, identified with the sea who will find profit and instruction in this volume. There is a large and increasing class among the gentlemen of our own and other countries who cultivate the sea for the pleasure that it yields, and who take a manly delight in the danger and excitement incident to sporting upon its surface, to whom a book like this must prove an auxiliary of great value. To these may be added, as likely to find advantage in this book, all whose business, or love of knowledge, prompts them to investigate the science of that world which has its habitation in, under, or upon the waters of the great deep.

We have already intimated that this work claims to be unique. It embraces, first, a complete dictionary of marine words and phrases; second, a large number of original articles on special topics; third, a copious fund of biographical data; and, fourth, a gazetteer of the principal naval stations and seaports of the world. No other work uniting these several features exists in our language, nor, we think we may confidently add, in any other.

Custom, no less than justice to those whose labors have produced the volume

now offered to the public, makes it proper to assign to the several collaborators the credit due for their respective shares in its preparation.

To Mr. Lewis R. Hamersly, who saw service with the navy during the war of the Rebellion, and who, as the compiler of "The Records of Living Officers of the Navy," and as the head of the military and naval publishing house of L. R. Hamersly & Co., is well known to the naval profession, credit is due for the conception and plan of the work, and also for the preparation of the general mass of records of officers which it contains.

On Lieutenant J. W. Carlin has devolved the main burden of the editorial conduct of the work. Besides numerous articles in other departments, he has exclusively written or compiled the astronomical articles and definitions, as also the entire mass of nautical definitions not herein specifically credited to others.

Medical Director Edward Shippen, whose biographical sketches of distinguished naval men of our own and former times constitute a feature of the work, has, besides the articles bearing his signature, given it the benefit of his editorial assistance in ways that have contributed largely to improve and perfect it.

Rear-Admiral George Henry Preble, besides the articles which appear over his signature, has contributed the definitions of naval titles, and has greatly assisted the work by his advice and encouragement.

Chief Engineer Albert Aston has contributed the general mass of definitions relating to machinery and steam-engineering, and Passed Assistant Engineer L. W. Robinson has also made valuable contributions to the same department.

To Naval Constructor S. H. Pook belongs the credit of having furnished the definitions of the terms pertaining to ship-building.

Lieutenant E. T. Strong, in addition to the articles signed by him, has contributed the definitions of nautical and naval terms which occur under the letters K, L, and T, respectively.

Lieutenant F. S. Bassett, in addition to the articles which appear over his signature, has compiled, or written, the greater part of the definitions included under the alphabetical headings F, S, W, and X.

In several departments of the work Colonel George A. Woodward, U.S.A., has assisted by contributions and editorial supervision.

The following is a list of the principal works consulted in the preparation of this volume: Smyth's Sailor's Word-book, Falconer's Marine Dictionary, Burn's Naval and Military Technical Dictionary, Cooper's Naval History, Bedford's Sailor's Pocket-book, Luce's Seamanship, Nares's Seamanship, Totten's Naval Text-book, Dana's Seaman's Friend, Harbord's Glossary of Navigation, Bowditch's Navigator, Loomis's Astronomy, Peabody's Astronomy, Proctor's Hand-book of the Stars, Cooke's Naval Gunnery, Ordnance Instructions (1880), Lippincott's Gazetteer, Wilson's Ship-building, Very's Navies of the World, King's War-ships and Navies of the World, Knight's Mechanical Dictionary, Sleeman's Torpedoes and Torpedo Warfare (*Electricity*), Myer's Manual of Signals, Navy Regulations, Webster's Dictionary, Worcester's Dictionary, Brande's Encyclopædia, Chambers's Encyclopædia, Appleton's Encyclopædia, Johnson's Encyclopædia, Kent's Commentaries, Sharswood's Blackstone.

LIST OF CONTRIBUTORS AND ARTICLES.

AMMEN, DANIEL, Rear-Admiral U.S.N.
- Balsa.
- Canals, Interoceanic.
- Cushing, W. B., Commander U.S.N.
- Life-boats and Life-rafts.
- Marine Rams.

ASTON, ALBERT, Chief Engineer U.S.N.
- Compound Engine.
- Compound Screw.
- Condenser.
- Crank.
- Expansion of Steam.
- Marine Steam-boiler.
- Marine Steam-engine.
- Ship-building, Iron.

BASSETT, F. S., Lieutenant U.S.N.
- Barron, James, Commodore U.S.N.
- Barry, John, Commodore U.S.N.
- Bay.
- Cape.
- Continents.
- Currents.
- Decatur, Stephen, Commodore U.S.N.
- Elliott, Jesse Duncan, Commodore U.S.N.
- Exploring Expeditions.
- Fire-ships and Rafts, Explosion-vessels and Booms.
- Gulf.
- Hopkins, Esek, Commodore U.S.N.
- Hull, Isaac, Commodore U.S.N.
- Islands.
- Lake.
- Lawrence, James, Commodore U.S.N.
- Oceans.
- Perry, M. C., Commodore U.S.N.
- Perry, O. H., Commodore U.S.N.
- Rivers.
- Routine of Duty in a Man-of-war.
- Sea.
- Ship.
- Sound.
- Stewart, Charles, Commodore U.S.N.
- Wilkes, Charles, Rear-Admiral U.S.N.

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- Nebular Hypothesis.
- Porter, D. D., Admiral U.S.N.
- Submarine Mines.
- Torpedo-boat.
- Torpedoes.
- Torpedo Station.

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- Naval Training Systems, Foreign.
- Reserve, Royal Naval.

COCHRANE, H. C., Captain U.S.M.C.
- Court-martial.
- Court-martial, Summary.
- Inquiry, Court of.
- Judge-advocate.
- Judge-advocate-general.
- Marine Corps.
- Oaths
- Pardoning Power.
- Provost-marshal.
- Witness.

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COLVOCORESSES, G. P., Lieutenant U.S.N.
- Chart.
- Sketching.

DICKINS, F. W., Lieutenant-Commander U.S.N.
- Naval Academies.

DOW, JESSE E.
- Navy Department.
- Navy, Volunteer, of the United States.

DULIN, JAMES C.
- Examination of Officers for Promotion and Retirement in the Navy, Board of.

THE following is a summary of the contents of the book:

I. A complete Dictionary of Nautical Terms and Phrases.

II. Biographical Notices of Distinguished Naval Officers of our own and foreign services.

III. Special Articles prepared expressly for this work by officers and others of recognized ability in their respective fields of discussion, and comprehending the freshest and most authentic information attainable respecting the several subjects treated.

IV. A Gazetteer of the Principal Naval Stations and Seaports of the World.

V. A Supplement containing concise Records of Living Officers of the Navy, including Captains, Commanders, Lieutenant-Commanders and Lieutenants, and Staff-Officers of relative rank. The records of Flag-Officers are included in the body of the work.

A NAVAL ENCYCLOPÆDIA.

A.

A. Abbreviation for *after* in the U. S. General Service Code of Signals. Contraction for *at*, *on*, or *in*, as, *a-stern*, *a-shore*, *a-poise*.

A 1. The highest class of excellence in merchant vessels. See CLASSIFICATION OF MERCHANT VESSELS.

Aalborg. A city and seaport of Denmark, in Jutland, on the south shore of the Lymfiord, near its mouth, in the Cattegat. Lat. 57° 2′ 46″ N.; lon. 9° 55′ 38″ E. Pop. 11,721.

Aarhuus. A seaport of Denmark, in Jutland, on the Cattegat, at the mouth of the Molle-Aue, 37 miles S.E. of Viborg. Lat. 56° 9′ 27″ N.; lon. 10° 12′ 46″ E. Pop. 15,000.

A. B. An abbreviation signifying *Able Seaman*. See ABLE.

Abab. A Turkish sailor who plies in coasting craft.

Aback. The situation of a sail when the wind acts on its forward surface. The sails are *laid aback*, or *thrown aback*, by hauling in the weather-braces or by putting the helm down, or both. They are *caught aback*, or *taken aback*, by a shift of wind, or by inattention at the helm. *Flat aback* means that the wind acts nearly at a right angle to the forward surface of the sail. *Taken aback* is also used figuratively for being taken by surprise. *All aback forward* is the notice from the forecastle that the head-sails have been taken aback. *Brace aback* is the order given to swing the yards and lay the sails aback.

Abaft. Behind. *Abaft the beam*, astern of a line forming a right angle with the keel.

Abaka. The fibre of which Manilla rope is made.

Abandon. To relinquish to underwriters all claim to property which may be recovered from shipwreck, capture, or any other peril stated in the policy. To desert a vessel on account of the danger in remaining on board.

Abatement. A demand for a reduction of freight when unforeseen causes have delayed or hindered the performance of a stipulated charter-party.

Abeam. Opposite the centre of the ship's side; on a line which forms a right angle with the keel.

Aberration. The apparent displacement of the stars, caused by the motion of the earth combined with the motion of light. The deviation of the rays of light from the principal focus of a lens.

Abet. To excite, encourage, or assist.

Able. Competent; strong. *Able Seaman*, a rating on the ship's books. He must be competent to perform all the duties required of a sailor.

Able-whackets. A sea game, in which the loser is beaten over the hands with a handkerchief, tightly twisted.

Aboard. On board; inside, or upon a ship. Residing afloat. *To keep the land aboard* is to hug the shore. *To fall aboard of* is for one vessel to foul another. *To lay an enemy aboard* is to run into or alongside of him. *To haul the tacks aboard* is to set the courses.

About. *To go about* is to change the course of a ship by tacking. *Ready about*, or *'boutship*, is the order to prepare for tacking.

Abox. The position of the head-yards when they are braced aback, the after-sails remaining full. *Brace-abox*, the order to lay the head-yards abox. This is done in boxhauling and occasionally in heaving-to, but is more generally done to box the ship's head off from the wind after she has been caught aback, or after she has missed stays.

Abraham-men. An English cant term for vagabonds who, under pretence of being destitute mariners, beg about the dock. A malingerer wanting to go on the sick-list is said to "sham Abraham."

Abrase. To dub or smooth planks.

Abreast. Side by side; opposite to; parallel with. *Line abreast*, a formation in which the ships are abeam of each other.

Abri. (*Fr.*) Cove; shelter; under the lee; a safe anchorage on a weather shore.

Abrid. A pintle-plate.

Abroach. On tap; in use.

Abroad. On a foreign station; in a foreign country. An old word for *spread;* as, all sail *abroad*.

Abrupt. Steep; broken; craggy; as, of cliffs and headlands.

Absence. State of being absent. *Leave of absence*, permission of the proper authority to be absent from post or duty for a specified time. *Absence without leave*, with manifest intention not to return, is *desertion*. When there is a probability that the party intends to return, he

is to be considered a *straggler* for ten days, at the expiration of which he is to be regarded as a *deserter*.

Absorption. A term formerly used for the sinking of islands and tracts of land Subsidence.

Abstract. An abridgment of the contents of a book or document.

A-burton. The situation of casks when stowed athwartships.

Abut. When two planks are joined endwise they are said to *butt* or *abut* against each other. *Abutting-joint* is a joint where the pieces come together at a right angle.

Abutment. The breech-block of a fire-arm.

Abyme. The site of constant whirlpools, as the Maëlstrom was supposed to be. An abyss.

Abyss. A depth without bottom.

Academies, Naval. The United States Naval Academy at Annapolis was founded and formally opened on October 10, 1845. On August 7, 1845, Mr. George Bancroft, Secretary of the Navy under President James K. Polk, issued instructions to Commander Buchanan for the opening of the school. The War Department had previously transferred to the naval authorities the site and buildings of Fort Severn, one of the defenses of Annapolis harbor, at the mouth of the Severn River, in the State of Maryland. The first step was to collect the midshipmen, who, from time to time, were on shore, and give them occupation in the study of subjects essential to the education of a naval officer. In October, 1849, a board of officers was convened to reorganize the institution, and to make it conform, as nearly as possible, to the system pursued at the Military Academy at West Point. The course of instruction and the regulations were revised, and the title of the institution was changed from Naval School to U. S. Naval Academy. In November, 1851, the course of study was fixed at four years. A practice-vessel was attached to the Academy for summer cruising, and a Board of Visitors was provided for, to attend the annual examinations, and to report upon the condition of the school. After the breaking out of the civil war, in May, 1861, the Academy, with all its apparatus and *personnel*, was transferred to Newport, R. I., where it remained until September, 1865, when it was returned to Annapolis. The programme of studies was then rearranged to conform more closely to modern ideas, and remains practically unaltered at this date. The course of instruction embraces the following studies, viz.: seamanship, which includes naval construction, naval tactics, practical exercises, signals, swimming, gymnastics, etc.; ordnance and gunnery, which includes infantry tactics, field-artillery and boat-howitzer exercise, great guns, mortar practice, and fencing; mathematics, which comprises algebra, geometry, trigonometry, analytical geometry, descriptive geometry, and calculus; steam engineering, comprising practical exercises, theory of steam-engine, and fabrication and designing of machinery; astronomy, navigation, and surveying; physics and chemistry; mechanics and applied mathematics, which includes, besides mechanics, the differential and integral calculus, and theoretical naval architecture; English studies, history and law; modern languages, French and Spanish; drawing, comprising right-line, free-hand and perspective, topographical, and chart making. On June 1, 1880, the *personnel* of the Academy was as follows: commanding officer and staff, including medical and pay officers and chaplain, 12; instructors, 46 commissioned officers and 15 civilians, 61; civil officers, including secretary, librarian, clerks, etc., 14; marine officers, 3; warrant-officers, 2; and 7 mates attached to the gunnery-ship and practice-vessels; total staff of the Academy, 99; number of cadet midshipmen, 253; of cadet engineers, 99; total of students, 352; aggregate, 451. The list of successive superintendents is as follows: 1st, Commander Franklin Buchanan, 1845–47; 2d, Commander George P. Upshur, 1847–50; 3d, Captain C. K. Stribling, 1850–53; 4th, Captain L. M. Goldsborough, 1853–57; 5th, Commodore George S. Blake, 1857–65; 6th, Vice-Admiral D. D. Porter, 1865–69; 7th, Rear-Admiral John L. Worden, 1869–74; 8th, Rear-Admiral C. R. P. Rodgers, 1874–78; 9th, Commodore Foxhall A. Parker, 1878–79. In June, 1879, Commodore Parker died, and was succeeded by Rear-Admiral George B. Balch as the tenth superintendent. In 1865 two classes of cadet engineers, not to exceed 50 in the aggregate, were admitted into the Academy. The duration of their course was, until June 1, 1873, two years. By act of Congress, approved February 24, 1874, their course was lengthened to four years, and the number of classes increased to four. The examinations of candidates for cadet engineers are competitive. Candidates must be between 16 and 20 years of age, and of sound body. The number of appointments that can be made is limited by law to 25 each year. The academic examination previous to appointment is on the following subjects, namely: arithmetic, algebra, through equations of the first degree, plane geometry, natural philosophy, reading, writing, spelling, grammar, composition, geography, free-hand drawing, and the elementary principles governing the action of the steam-engine. Candidates who possess the best knowledge of machinery, other qualifications being equal, have precedence for admission. The pay of cadet engineers while at the Academy is $500 per annum. After the academic course, two years' sea-service is required before being eligible to be commissioned as assistant engineers, and then only as vacancies occur. The studies of cadet engineers at the Academy consist of mathematics, analytical mechanics, theory and practice of steam engineering, physics and chemistry, French and Spanish, drawing, designing of machinery, naval architecture, and practice in the workshops. On March 3, 1873, Congress passed a law changing the duration of the course for cadet midshipmen from four to six years, to apply to the class admitted in 1873 and to all subsequent classes. Four years of the six are passed in completing the academic course, the remaining two years are passed at sea on board a regular cruising-vessel, after which they return to the Academy and are required to pass the following final graduating examination: physical, ordnance, naval tactics, navigation, French and Spanish, seamanship, and steam. The marks of this examination, combined with those of the academic course, determine the graduating number; and passing successfully, the *cadet midshipman* becomes a *midshipman*, and he is then eligible to be commissioned an ensign when va-

cancies occur. The number of cadet midshipmen allowed at the Academy is one for every member and delegate of the House of Representatives, ten at large, and one from the District of Columbia, appointed by the President. The nomination of a candidate from any Congressional district or territory is made on the recommendation of the member or delegate from actual residents of his district or territory. Candidates must be of sound body, between 14 and 18 years of age, and present themselves to the superintendent of the Academy for examination for admission in June and September. The examination in reading is of course conducted orally, all other examinations are in writing. A satisfactory examination must be passed in arithmetic, geography, grammar, writing, and spelling. Candidates who pass the physical and mental examinations will be appointed as cadet midshipmen and become inmates of the Academy. Each cadet is required to sign articles by which he binds himself to serve in the navy eight years, including the time at the Academy, unless sooner discharged. The pay of a cadet midshipman is $500 a year, commencing at the date of his admission. The academic year begins October 1, and ends May 30. The year is divided into two academic terms, the first term extending from October 1 to January 30. Each of the classes is divided into a convenient number of sections of from nine to twelve members, and the recitation hours into three periods of two hours each, and no student is required to attend more than three recitations during the day; so that besides the evening study hours, one hour of each period may be devoted to study. The system of examination comprises monthly, semiannual, and annual examinations, all of which are conducted in writing, the same questions being proposed to each member of a class. If the cadet fail to pass the semi-annual or annual examination he is dropped. The monthly examination-marks are combined with the daily marks to determine the monthly standing. These marks are combined with those of the semiannual examination to find the term standing, which latter are again combined to form the annual record. The summer months are employed in cruising at sea. The sailing-vessels "Santee," "Constellation," and "Dale," the ironclad monitor "Nantucket," and the steamers "Mayflower" and "Standish" are permanently stationed at the Academy during the two academic terms for the purpose of instruction in great guns, and in sails, spars, steam, etc. The "Constellation" is commissioned for the summer cruise of the first and third classes of cadet midshipmen. The second class is granted leave during the summer, and the fourth class, admitted in June, is quartered on board the "Santee" for practical instruction until the beginning of the academic year. The first and third classes of cadet engineers are embarked on board the practice-steamers, and visit the United States navy-yards and private ship-yards, particularly those where iron ship-building is done, foundries, rolling-mills, machine-shops, etc. They are required to take notes and make sketches of machinery, etc., at every place visited. The second class of cadet engineers goes on leave. The officers for all the practice-vessels are detailed from the officers attached to the Academy. The academic grounds inside the walls consist of 50 acres. The grounds outside consist of 109 acres. Aggregate, 159 acres. The departments of study and the observatory are amply supplied with models and apparatus. The library contains 20,000 volumes, chiefly historical, scientific, and professional. At the International Exhibition held at Paris, France, in 1878, the United States Naval Academy received a diploma of the value of a gold medal, which was one of the four diplomas awarded to educational institutions in the United States for the best quality of education in the group classed as superior.

England.—The Royal Naval Academy was first established at Portsmouth dock-yard by order from the admiralty dated March 13, 1729, the age of admission being between 13 and 16 years. The young gentlemen entered the naval service either by nomination from the admiralty through the Royal Naval Academy, or by direct nomination to sea-going ships by flag-officers and captains of ships in commission. In 1806 the title of the establishment was changed to Royal Naval College. In 1816 the college was united to the School of Naval Architecture, and the age of admission fixed at from 12½ to 14 years. In 1821 the age was again altered, from 12½ to 13½ years, and so continued until the college was closed, in 1837. The number of cadets allowed after 1806 was 70, mainly selected from the nobility and gentry. The college was closed owing to the old method of appointing midshipmen directly into the navy without any conditions of previous preparation existing at the same time, which, being short and easy, was commonly preferred. After passing an easy entrance examination, the course of instruction at the college was not much more than elementary, and extended over a period of two years. After a year's sea-service the student was eligible to be rated as midshipman. In the year 1839 the Royal Naval College was reopened for the purpose of establishing further means of scientific education for a certain number of commissioned officers, who were allowed to remain at the college for one year. In the beginning of 1857—the experience of twenty years since the abolition of the old naval college as a seminary for boys having meanwhile fully demonstrated the necessity for some kind of preliminary training for cadets on their first entry into the service—the admiralty established a new system of instruction on board a training-ship, to which the cadets were to be appointed after passing into the service by a moderate test examination, with some modification of detail on certain points. The system of educational training established in 1857 still continues in force. In 1868 a sea-going ship was established supplementary to the stationary one. Under the regulations at present in force the candidate must not be under 12 nor above 13 years of age. The principle of limited competition has also been introduced. Candidates must pass a strict physical examination, and afterwards undergo a preliminary test examination in reading, writing, dictation, French, arithmetic as far as vulgar and decimal fractions, and Scripture history. Those who successfully pass this examination are allowed to compete in a further examination in arithmetic, algebra to simple equations, Book I. of Euclid, French, Latin, English history, geography, German, Italian or Spanish, and

drawing,—the candidates selecting not more than three of these subjects, or four, if drawing be one. Successful competitors are then appointed to the "Britannia," at Dartmouth, as naval cadets. The course of instruction there lasts two years, and is supplemented by a year's further training on board a special sea-going training-ship. On leaving the "Britannia" the cadets are classed according to their merits in study and conduct. Cadets having obtained one year's sea-time on leaving the training-ship, are rated as midshipmen. During the three years on board the training-ships the cadets study the following subjects: mathematics, consisting of a partial course in arithmetic, algebra, geometry, and trigonometry, with a short course in steam, elementary surveying, English, French, geography, history, and drawing. After completing five years' service, including the time on board the training-ships, and having attained the age of 19 years, they are eligible to pass for lieutenant. The Royal Naval College at Greenwich was reorganized and opened February 1, 1874, for the instruction of officers of all branches of the naval service, including captains and excluding midshipmen.

France.—Students are admitted to the Naval School on board the "Borda," at Brest, once in each year, by competitive examination. Candidates of respectable parentage are eligible for admission, provided they are native Frenchmen or have been naturalized, and are not less than 14 or more than 17 years of age on the 1st of January of the year in which they compete. Their parents are obliged to pay the equivalent of $140 a year to support them while at the school. The examinations are held in July at Paris and at seven other large cities in France, and in Corsica and Algiers. The examination, partly written and partly oral, is on the following subjects: written—French and English composition; numerical calculation of plane trigonometry, and descriptive geometry; oral—French and English, general history, geography, arithmetic, algebra, geometry, trigonometry, and descriptive geometry. To these is added drawing from nature. If the candidate pass the oral examination, he undergoes a further examination, more searching in the same subjects, for competition. A committee in Paris selects the prescribed number of candidates in order of merit. Those selected join the training-ship "Borda" on October 1, and remain there two years. The subjects of instruction are literary, scientific, and professional. An examination is held at the end of each year, and those that fail to pass in either branch of instruction are dismissed. At the end of two years those who pass successfully are sent on board the cruising-ship "Jean Bart," where the course is strictly practical. The cruise lasts about one year, and on their return an examination is held in the following subjects: naval architecture, steam, seamanship, naval gunnery, infantry tactics, navigation and surveying, naval regulations, literature, English, drawing, naval book-keeping, international and maritime law, and naval hygiene, which finishes the course. There are also a certain number of students who pass directly from the Polytechnique School into the "Jean Bart," and during their subsequent service they are in no way distinguished from those who have been trained in the "Borda." The "Jean Bart" also receives a few students from the corps of naval constructors, and takes them to sea.

Germany.—The officers' corps of the Imperial navy is made up from young men that enter the service as cadets, and from sailors that are granted such a chance for advancement. Applications for admission as cadet must be made to the admiralty at Berlin during the months of August and September of the year preceding the examination for admission. The application must be accompanied by a number of papers giving a detailed account of the candidate's family, his intellectual training and physical condition. The examination is held every year, in the month of April, before an examining board at Kiel, appointed by the chief of the admiralty. The candidate must first pass a physical examination, and not be more than 17 years of age, except a graduate of a high school, who must not be more than 19 years of age. The examination for admission is in the following subjects: Latin, grammar, arithmetic, geometry, trigonometry, elements of physics, geography, history, French and English, and free-hand drawing. If the candidate has a certificate of graduation from a high school, or a school of equal rank, he is freed from an examination if his record in mathematics be good; if not, he must pass an examination in that branch. The results of this examination are sent to the chief of admiralty, who decides which ones shall be admitted. The cadets must pay their own expenses. The cadets selected for admission are embarked on board a practice-ship. They cruise during the summer and return to the station in September. Those cadets that show a want of aptitude for the service are then dismissed by order of the admiralty. The remaining cadets receive certificates signed by the commanding officer and other officers of the practice ship, and are ordered to attend the cadets' class of the naval school after taking the oath of allegiance. The instruction in the cadets' class is intended to prepare the cadets for the *Naval Cadets'* examination, and lasts about six months. This examination embraces the following subjects: navigation, seamanship, artillery, infantry tactics, arithmetic, trigonometry, geometry, chemistry, official reports, topography, English and French. Those failing to pass are either turned back or dismissed. Those cadets that have passed are embarked on board a practice-ship, and sent on a cruise for two years. During that time they receive practical training, and are also instructed in those branches of science more strictly professional. At the end of the cruise, those receiving a satisfactory report from the commander of a vessel are ordered to attend the first officers' examination at Kiel in the following subjects: navigation, seamanship, naval tactics, artillery, marine engines, naval architecture, knowledge of the duties of officers, French and English. Those that pass the examination are appointed second lieutenants without commissions, and are made to attend the officers' class of the Naval Academy. The course of instruction commences in October and closes the following August, and is intended to complete the theoretical education, and prepare the members for the second officers' examination, which takes place each year, in September, at Kiel, and in the following subjects: navigation, infantry tactics, artillery, naval architecture, marine engines, fortification,

drawing, geometry, trigonometry, mechanics, and physics. Full reports of the examination are submitted to the admiralty, the relative standing of those that have passed finally determined, and commissions as second lieutenant are issued. Sailors are admitted on the recommendation of their superior officers after a service of at least twelve months on board a man-of-war, and must not be over 20 years of age. The regulations for admission and examinations are the same for sailors as for those persons entering from civil life.

ITALY.—The candidates enter at Naples on the 15th of June in each year; they must be of sound body, not less than 13 nor over 17 years of age, and must give security that their expenses will be paid. The examination for admission is competitive, and is in arithmetic, elementary algebra, geometry, ancient history, grammar, French, and geography. The Royal Naval School is composed of two divisions,—the first at Naples, and the second at Genoa. The course at Naples is two years, and comprises the following subjects: algebra, geometry, trigonometry, descriptive geometry, navigation, French and English, drawing, calculus, physics, descriptive and political geography, and Italian literature. The last two years of the course are passed at Genoa, and the following subjects taught: mechanics, astronomy, hydrography, history, political geography, Italian literature, French and English, theory of ships, naval construction, naval tactics, fortification, artillery and infantry tactics, torpedoes, and practical exercises, including fencing, gymnastics, swimming, and dancing. The practice-cruises are made each year from June to November, and the examinations take place before the cruise begins. Those who graduate are recommended for nomination to the grade of midshipmen, and go directly into active service.

RUSSIA.—Those who are desirous of entering the naval service must pass into the Naval School at St. Petersburg. Candidates eligible for admission must be sons of hereditary noblemen, of superior civil or military officers, or of hereditary honorable citizens. The age of candidates must not be under 15 nor over 18 years. Those candidates who may wish it are allowed, before entering the school, to go through a trial-cruise to test their aptitude for the service. If the trial-cruise be satisfactory the candidate must pass a physical and mental examination. The examination is held yearly, in the month of September, embracing the following subjects: religion, grammar, geography, history, arithmetic, algebra, geometry, and French. The course of instruction lasts four years, at the expense of the government. At the end of four years the students are examined in the subjects mentioned as follows: religion, navigation and pilotage, astronomy, seamanship, naval history, naval tactics, gunnery, surveying, steam, theoretical and practical naval architecture, fortification, jurisprudence, and Russian and French languages. Having passed this examination the student is made a naval cadet, and is embarked on board a training-ship to cruise for two years, at the end of which he is subjected to a final examination in practical seamanship.

SPAIN.—The Naval College for midshipmen was created by royal decree, September 18, 1844, in order that young men who desire to become naval officers may learn, theoretically and practically, their profession. It is situated in San Carlos, department of Cadiz. The *personnel* is composed of, besides the commanding officer and staff, 11 professors of mathematics, 1 of physics, and 10 for drawing, seamanship, ship-building, English and French, fencing, gymnastics, and dancing, 2 chaplains, and 8 lieutenants, who, besides their duties as officers, give military instruction to the cadets. By a royal decree of February 20, 1864, only 60 can enter yearly. The candidate must be between 13 and 16 years of age. All the vacancies, except four, are filled by competitive examination in the following subjects: religion, reading, writing, grammar, arithmetic, algebra, geometry, French and English, geography, and drawing. By the last-mentioned decree the time in the college has been reduced from two and a half years to one year and a half, and the students study the following subjects: trigonometry, geometrical analysis, astronomy, navigation, physics, meteorology, chemistry, gunnery, French and English, naval tactics, infantry tactics, seamanship, geography, history (sacred, profane, and naval), religion and morals, drawing, fencing, gymnastics, swimming, and dancing.—*F. W. Dickins, Lieutenant-Commander U.S.N.*

Academite. A graduate of the Royal Naval Academy at Portsmouth, England.

Acair-phuill. A safe anchorage.

Acalephæ. A class of marine animals of low organization, having a translucent jelly-like structure, and frequently possessing the property of stinging; as, the Portuguese man-of-war (*Physalia*), and the common jelly-fish (*Medusa*).

Acapulco. A seaport of Mexico, on the Pacific. Lat. 16° 50′ N.; lon. 99° 48′ W. It has a magnificent landlocked harbor, and is 302 miles S.S.W. of Mexico. Pop. 5000.

Acast. An old word for *lost* or *cast away.* Abox; as, the head-yards were said to be braced *acast.*

Acater. Purveyor of victuals, whence *caterer.*

Acatium. A word used by the Romans for a small boat, and also for the mainmast of a ship.

Acceleration. The increase of velocity in a moving body. A planet is said to be accelerated when its actual diurnal motion exceeds its mean. In the fixed stars this acceleration is the mean time by which they anticipate the sun's diurnal motion. Acceleration of the moon is the increase of her mean motion, caused by a slow change in the eccentricity of the terrestrial orbit.

Access. Means of entry or approach. *Accessible,* approachable by land or sea.

Acclivity. The upward slope of an inclined cliff.

Accoil. To coil together.

Accommodations. Fittings, conveniences. *Accommodation ladder,* a convenient flight of steps shipped at the gangway. When shipped on both sides, the starboard ladder is reserved for the use of commissioned officers and their visitors.

Accompany. To sail together; to convoy.

Accon. (*Fr.*) A flat-bottomed Mediterranean boat for carrying cargoes over shoals.

Accost. To hail; to pass within hail; to sail coastwise; to draw near.

Account. *Going upon account*, a phrase for buccaneering.

Accounts. The several books and registers of money, stores, clothing, and provisions. See PAYMASTER.

Accouplement. A timber tie or brace.

Accoutrements. Equipments of soldiers and marines.

Accul. An old term for the end of a deep bay; from *cul-de-sac*.

Accuse. To charge with an offense.

Accused. The designation of the party on trial before a court-martial. See COURT-MARTIAL.

Achernar. *α Eridani*, a star of the first magnitude in the constellation Eridanus, called by navigators the "Spring of the River."

Achromatic. A term applied to optical instruments in which aberration and the colors dependent thereon are partially corrected. *Achromatic condenser*, a lens used to concentrate the rays of light on an object in a microscope.

Achronical. An old term signifying the rising of a heavenly body at sunset, or its setting at sunrise.

Acker. An eddying ripple on the surface of flooded waters. A tide swelling above another tide. See EAGRE, BORE.

Ackmen, or Ack-pirates. Fresh-water thieves.

A-cockbill. A yard is *a-cockbill* when by accident or design one yard-arm is topped up more than the other. (See MOURNING.) The anchor is *a-cockbill* when it hangs from the cat-head by the ring-stopper ready for letting go. In the navy the anchor is not cockbilled except in special cases.

Acolyte. The smaller component of a double star.

Acorn. A cone-shaped piece of wood attached to the vane.

Acoustics. The science of sound. The *acoustic telegraph* is one which makes audible instead of visible signals

Acquit. To discharge from an accusation; to free or exonerate from blame or suspicion; to clear from imputation. The word is also used to express personal bearing; as, to acquit one's self well.

Acquittance. A release or discharge in writing for a sum of money, or duty, which ought to be paid, or done, on the ship's account.

Acre. A city and seaport of Syria, on a promontory at the foot of Mt. Carmel. Lat. 32° 55′ N.; lon. 35° 5′ E. Pop. 4800. The Bay of Acre is much frequented by French, Italian, and Austrian vessels.

Acrostolium. A symbolical ornament on the prows of ancient vessels; the origin of the modern figure-head.

Act. Deed, performance, edict, decree, or law. *Overt act*, an open act done in pursuance of a criminal design,—the mere design not being punishable without such act. *Act of God* comprehends all accidents arising from physical causes. *Act of Court*, the decision of the judge on the verdict or on a point of law. *Act and Intention* must be united, in admiralty law.

Acting. A prefix to denote that a rank is held temporarily.

Action. Exertion of power or force. *Double action* denotes that the motor acts positively in producing the backward and forward movement. An engagement; a battle. *Clear ship for action*, to prepare for battle by removing everything that obstructs the working of the battery or hinders the handling of the ship; by removing all fixtures and appliances, not needed for action, but which might cause the enemy's shot to create havoc and confusion; by removing articles liable to injury by exposure; and by providing articles necessary to the security of rigging and spars.

Active. Requiring or implying action or exertion; practical; operative.

ACTIVE LIST. The list of officers liable to be called upon for active duty, in contradistinction to the Retired List (which see).

ACTIVE SERVICE. Duty before the enemy, or operations in his presence. Any duty under the orders of the Navy Department.

Actuaire. (*Fr.*) An open transport propelled by oars and sails.

Actuairole. (*Fr.*) A small galley propelled by oars.

Acumba. Oakum; the *hards* or coarse parts of flax and unplucked wool.

Acuña, Christopher. Jesuit and explorer, b. Burgos, 1597, d. Lima about 1675. He was one of the early explorers of the river Amazon, and was sent to report the incidents of the expedition of 1639. On his return to Spain he published at Madrid, in 1641, "Nuevo Descubrimiento del gran Rio de las Amazonas." He subsequently went to the East Indies, returned to South America, and died on the way from Panama to Lima.

Adamant. The loadstone; the magnet:—the sense in which it was held by early voyagers.

Adapter. A ring or tube to adapt or fit any accessory apparatus to an instrument.

Addel, or Addle. The putrid water in casks.

Addice. An adze. The addled eggs of sea-fowl.

Addlings. Accumulated pay.

Address. Bearing. To consign or intrust to another as an agent.

Adelaide, Port, six miles from the capital of South Australia. Lat. 34° 49′ S.; lon. 138° 38′ E. It is a free port, and accessible for vessels drawing 18 feet of water.

Adit. An air-hole or drift. The aperture by which a mine is dug and charged. The aperture by which a ship in ancient times was entered.

Adjourn. To put off to another day; to discontinue a while; to intermit proceedings; as, of a court-martial, a board of examination, etc. When no certain day is fixed to which the adjournment is to extend, it is said to be *sine die*.

Adjudication. The act of adjudging prizes by legal decree. Captors are compelled to submit the adjudication of their prizes to a competent tribunal.

Adjust. To set the frame of a ship. To regulate an instrument for use. *To adjust the compasses* is to ascertain the deviation of the needle due to local attraction.

Adjustment, in marine insurance, is the ascertaining and settling of the amount of indemnity, whether of average or salvage, which the insured is entitled to receive. The nature and amount of damage being ascertained, an endorsement is made on the back of the policy, declaring the proportion of loss falling on each underwriter; and when this endorsement is signed by the latter, the loss is said to have been adjusted. After an adjustment has been made, it

is usual for the underwriter at once to pay the loss. As a question of law, however, it does not appear how far the adjustment is conclusive and binding on the underwriters. In the opinion of some lawyers the adjustment is merely presumptive evidence against an insurer, and it is, notwithstanding, open to the underwriter to show facts which, if proved, would have the effect of relieving him from liability.

ADJUSTMENTS OF INSTRUMENTS. All nautical instruments are liable to get out of order, their several parts not retaining their relative positions, owing to unequal expansion, violence, or like causes. To guard before observing against resulting errors, there are *methods of testing* whether the instrument is in order in the several points subject to be affected; and the instrument is provided with *means of adjustment*, chiefly in the form of screws or sliding weights, by which it may be restored to its correct state. Adjusting screws and weights ought not to be touched more than is absolutely necessary, and then with great care. When two such screws work oppositely to each other, one must not be tightened without the other being at the same time loosened. Sometimes, instead of making the adjustment, the error may be acknowledged and allowed for in observing. The term "adjustments" is often loosely applied to all sources of incorrectness, and means of obviating their effects, in using instruments. These are, however, properly of three distinct kinds: *imperfections* in the instrument, which should cause its rejection; *adjustments* for parts of the instrument liable to temporary derangement, but which can be restored to order by the machinery attached; and *errors* of the instrument, which are acknowledged, determined by experiment, and allowed for. See COMPASS and SEXTANT.

Adjutant. See MARINE CORPS.

Admeasurement. The calculation of the proportions of a ship according to assumed rules.

Administration, Naval (Lat. *ad*, "to," and *ministro*, *ministratum*, "to serve," management, conduct of business), relates to the management of that part of the executive branch of the government which includes the navy, or *military marine*. The Chief Executive is generally the constitutional or hereditary head of the navy. James I., of England, assumed the title of Lord High Admiral and Lord General; in other words, he declared himself to be the commander-in-chief of the army and navy. This was subsequently confirmed to the reigning sovereign by act of Parliament (13 Car. II., c. 6). In the United States the President is the Commander-in-Chief of the Army and Navy, "and he may require the opinion in writing of the principal officer in each of the executive departments upon any subject relating to the duties of their respective offices." (Constitution of the United States, Art. II., Sec. 2.) One of these "executive departments" is styled, by the act of April 30, 1798, which creates the office, the *Department of the Navy*, and the "principal officer" the *Secretary of the Navy*, whose duty it is "to execute such orders as he shall receive from the President of the United States relative to the procurement of naval stores and materials, and the construction, armament, equipment of vessels of war, as well as all other matters connected with the naval establishment of the United States. From the language of the act it will be seen that the Secretary of the Navy is, in all matters pertaining to his branch of the public service, the exponent of the President; and his acts are to be considered the acts of the President, and have full force and effect as such. The official duties of the heads of executive departments, however, are not merely ministerial; they involve the exercise of judgment and discretion. (Decatur *v.* Paulding, 14 Pet., 515.) The Secretary of the Navy is appointed by the President, by and with the advice and consent of the Senate, from civil life, and is one of the members of his Cabinet. He is authorized by law to prescribe regulations, not inconsistent with law, for the government of his department, the conduct of its officers and clerks, the distribution and performance of its business, and the custody, use, and preservation of the records, papers, and property appertaining to it. He is required to make an annual report to Congress of the operations of the navy for the preceding year, its general condition, etc. The business of the Department is distributed among eight bureaus, to wit: (1) Bureau of Yards and Docks, (2) Equipment and Recruiting, (3) Navigation, (4) Ordnance, (5) Construction and Repair, (6) Steam Engineering, (7) Provisions and Clothing, (8) Medicine and Surgery. The chiefs of bureaus are appointed by the President, by and with the advice and consent of the Senate. All the duties of the bureaus are performed under the authority of the Secretary of the Navy, and "their orders are considered as emanating from him and have full force and effect as such" (act of August 31, 1842). There are 63 clerks, draughtsmen, etc., in the Department, 17 of whom belong to the Secretariat, the remainder to the several bureaus. The chiefs of four bureaus (1, 2, 3, and 4) are selected from the line-officers not below the rank of commander. During the time of holding office they have the relative rank of commodore, if below that grade. The chiefs of the other bureaus are selected from the several corps which they represent, and while holding office have the relative rank of commodore, with the title respectively of surgeon-general, paymaster-general, engineer-in-chief, and chief constructor. Chiefs of bureaus hold their offices for the term of four years. Any staff officer who has performed the duty of a chief of a bureau for a full term is exempt thereafter from sea-duty, except in time of war, and retires with the relative rank of commodore.

It will be perceived from the foregoing that the Navy Department, and consequently the navy itself, is without a professional head. The civil branch is well provided for in the constitutional commander-in-chief and his constitutional adviser, the Secretary of the Navy. But regarding the navy in its true character of a *sea army*, there is no professional head in our naval administration to govern its purely military operations. This is a great, and, in time of war, would be likely to prove a fatal, defect. It would be difficult, indeed, to find a civilian in whom were combined the political training essential to a Cabinet officer and the technical knowledge necessary to an intelligent and energetic administration of naval affairs even in times of profound peace.

The history of our naval administration is curious. The infant navy was ushered into ex-

istence by spasmodic resolutions of the Continental Congress. On the 5th of October, 1775, a resolution directed the fitting out of two armed schooners to cruise for a vessel known to have left England with munitions of war for the enemy. A week later another resolution directed the equipping of a swift vessel of 10 guns, and three members of Congress — Messrs. Deane, Langdon, and Gadsden—were chosen a committee to superintend this "naval force." October 20 four members—Hopkins, Hewes, Lee, and John Adams—were added, when it was resolved that "these seven be a committee to carry into execution with all possible expedition the resolutions of Congress for fitting out armed vessels." The committee immediately procured a room in a public-house in Philadelphia, and agreed to meet every evening at 6 o'clock for the dispatch of business. January 25, it was resolved that the direction of the fleet fitted out by order of Congress be left to the Naval Committee. In subsequent resolutions this committee was styled the *Marine* Committee, and was empowered to give names to ships, to order them on service, purchase materials, etc. June 9, 1779, it was resolved that the management of all business relating to the marine of the United States be vested in commissioners. October 28, 1779, a Board of Admiralty was established to superintend the naval and marine affairs. February 7, 1781, the office of a Secretary of Marine was created. August 20, on the report of a committee, it was resolved that "for the present an agent of marine be appointed," who should absorb all the duties that had devolved upon the Board of Admiralty. On the termination of the war of the Revolution (1783) the navy was disbanded. The present government went into operation under the Constitution March 4, 1789, and on the 7th of August following an act was passed establishing the Department of War, the Secretary of which was to have a general supervision of the land and *naval* forces. April 30, 1798, the act was passed creating the Department of the Navy, a Secretary of the Navy, a principal clerk and such other clerks as he (the Secretary) thought necessary. The act of February 7, 1815, added to the Department a Board of Navy Commissioners, consisting of three officers of the navy not below the rank of post-captain. The act provided that "the board so constituted should be attached to the office of the Secretary, and under his superintendence discharge all the ministerial duties of that office relative to the procurement of naval stores and materials, and the construction, armament, equipment, and employment of vessels of war, as well as other matters connected with the naval establishment." The act of August 31, 1842, abolished the naval commissioners and substituted five bureaus, since increased, by act of July 5, 1862, to eight. By act of July 31, 1861, the office of Assistant Secretary of the Navy was authorized, the exigencies of war showing its necessity. The office was abolished soon after the war (March 3, 1869).

The act of March 2, 1865, created the office of Solicitor and Judge-Advocate-General. June 22, 1870, it was transferred to the Department of Justice, as *Naval Solicitor* (Sec. 249, Revised Statutes). For that important factor of the navy, the Marine Corps, see article under that head.

GREAT BRITAIN.—Immediately after the revolution of 1688 Parliament passed an act (2 Sess. William and Mary) establishing a Board of Admiralty; thus giving the sanction of law to the practice that had long prevailed, of placing the control of the navy in the hands of experienced officers. By this act it was "declared and enacted that all and singular authorities, jurisdictions, and powers which, by any act of Parliament or otherwise, have been and are lawfully vested . . . in the Lord High Admiral of England for the time being, have always appertained to, and may be exercised by, the Commissioners for executing the office of High Admiral of England for the time being according to their commissions." Two years later, it was resolved in the House of Commons that "His Majesty be advised to constitute a commission of the Admiralty of such persons as are of known experience in maritime affairs; that for the future all orders for the management of the fleet do pass through the Admiralty that shall be so constituted."

The Admiralty patent, as it is called, places in the hands of "Our Commissioners for executing the office of Our High Admiral" full power to administer the affairs of the navy. It enjoins upon all persons belonging to the navy to observe all such orders as "Our said Commissioners, or any two or more of them, give," . . . "as if Our High Admiral had given it." According to the patent, all the members are equal, with co-ordinate powers, and with joint responsibility. According to usage the responsibility rests almost entirely with the First Lord. He nominates the other members "at his pleasure." He is, therefore, practically supreme; if opposed by the other members he may break up the board. Besides the First Lord, who is a cabinet officer appointed almost invariably from civil life by the Prime Minister, there are three naval members, and one other, who is always taken from among the members of the House of Commons. The board meets every week-day at noon, except Saturdays, and two lords and a secretary form a quorum for business. Certain orders may be signed by the secretary of the board alone, and are regarded as the order of the board collectively; but an order that authorizes the payment of money requires the signatures of two lords. The secretaries have jointly charge of the Secretariat, and the First Secretary has important duties in Parliament in connection with the board. See ADMIRALTY.

It will be seen from the foregoing that the First Lord has general control of the navy in the name of his sovereign, to whom he is responsible for its management. But he represents the civil power, and concerns himself more immediately with the civil affairs of the navy. Associated with this civil office, but subordinate to it, is the military branch of the establishment. This is presided over by professionals,—the senior Sea Lord and his coadjutors, the other Sea Lords and the Naval Secretary.

No form of naval administration can hope for entire immunity from public criticism; the Board of Admiralty forms no exception to the rule. The slightest mishap in the navy is sufficient to call down the thunders of the press on the heads of the Lords of the Admiralty. Discussions in Parliament led (March, 1861) to the appointment of a committee "to inquire into the con-

stitution of the Board of Admiralty and the various duties devolving thereon;" also "as to the general effect of such system on the navy." No material change took place, however, till January 14, 1869, when Mr. Hugh C. E. Childers, then First Lord, reorganized the board. On the 19th of March, 1872, the order of 1869 was rescinded, and the board restored very much to its old organization and as it now stands. See ADMIRALTY.

FRANCE.—The *Minister of Marine* (Secretary of the Navy) in France is generally selected from the list of admirals, and represents both the civil and military power. He is assisted in his immediate office by a staff of about seven officers, ranking from rear-admiral to lieutenant. The chief of staff is a rear-admiral (*chef d'état-major et chef du cabinet*). Next comes a Board of Admiralty, of which the Minister of Marine is president. It consists of, 1, a vice-admiral, who is vice-president of the board; 2, a vice-admiral; 3, a general of marine artillery; 4, a vice-admiral; 5, a vice-admiral; 6, a rear-admiral; 7, a director of naval construction; 8, a commissary-general. The Secretariat is divided into two *bureaux*, each of which has its chief. The second *bureau* takes cognizance of the "movements of the fleet and military operations," and is presided over by a naval officer of rank. Next we have the Navy Department proper, which is divided into five *directions* (a *direction* corresponding to a bureau in our Navy Department), each *direction* having two or more *bureaux;* each *bureau* having two or more *sections*. Among these several *directions*, *bureaux*, and *sections* are distributed with much precision all the duties of an extensive and thorough naval administration. The Minister of Marine alone is responsible to the chief magistrate for his acts. The Board of Admiralty, of which he is president, is but an advisory body, its chief and only important duty being to prepare the annual lists of officers from which the selections for promotion are made. It has, in fact, but little, if anything, to do with the administration of the affairs of the French navy.

It may be said, in general, that under a liberal form of government, like that of the United States or Great Britain, where the civil power predominates, the head of the navy will always be a civilian. In countries where the military spirit prevails the head of the navy will always be a naval officer of rank. In *all* maritime countries the work of the navy department must be distributed among a number of experts and a certain clerical force.

AUSTRIA.—The Minister of National Defense presides over both war and navy departments. Under his general supervision a vice-admiral administers the affairs of the navy.

DENMARK.—The Minister of Marine is a cabinet officer and a naval officer of rank.

GERMANY.—Has a Board of Admiralty, with an admiral for "Inspector-General of the Navy," and a commander-in-chief of all the ships in commission.

ITALY.—Has a Minister of Marine, at present a rear-admiral, assisted in his duties by a Board of Admiralty.

RUSSIA.—The Minister of Marine is an admiral, and communicates directly with the sovereign. He has sole charge of the administrative department of the navy, while the executive branch is in charge of the High Admiral of the fleet. In other respects the organization is similar to that of the French.

SPAIN.—Has a Board of Admiralty.

The navy departments of other European governments do not vary in any important point from those already given.—*S. B. Luce, Captain U.S.N.*

Admiral. Sir Wm. Monson, writing about 1600, says, "There have been often disputes whether the title of Admiral or General were more proper to a sea commander; and though I dare not presume to conclude of either, yet I think it is as unproper to call an Admiral General by Sea as to call a General Admiral by Land, though I confess their authorities are like in command of men's persons, yet is the jurisdiction of the Admiral by sea greater than the other, in that he ruleth and guideth a fleet of ships, which are of more importance to the King and State than the lives of men that are to serve in them."

The English title of *admiral*,—in French and Danish, *amiral;* German, *ammiral;* Dutch, *admiral*, or *ammrael;* Italian, *ammiraglio;* Spanish, *almirante*,—evidently in all modern languages derived from the same source, is yet of doubtful etymology. Most of the old writers trace it to the Arab *emir* or *amir*, a prince or ruler, and a Greek word signifying the sea; but Spelman, who condemns this "Centaur" derivation, thinks the term was first in use among the Saracens, and from thence brought to England about the time of Richard I. or Henry III.; "for I find," he says, "that not only *Amera* but *Almirante* was the ordinary title of the Governors of countries through all the territories of the Saracens, even from Spain when they possessed it, unto the uttermost parts of Lesser Asia, and Mahomet was so called as king, a name of dignity and estimation." In the great ship or dromond taken by Richard I. from the Saracens there were *seven* admirals.

The Earl of Berkeley is said to be the only individual not of royal blood who has ever won the flag of Lord High Admiral of Great Britain at sea. At the age of 20, then known as Lord Dursley, he was captain of the "Lichfield," 50, his second command. When 23 he commanded the "Boyne," 80. At 27 he was vice-admiral of the blue, and the next year vice-admiral of the red. March 29, 1719, at the age of 38, he hoisted his flag on the "Dorsetshire" as Lord High Admiral, being actually Vice-Admiral of England and First Lord of the Admiralty.

The first English admiral on record is Richard de Lacy, to whom, 1216–72, Henry III. granted *Maritimam Angl*æ. Some, however, assert that the honor belongs to Roger de Leyburn, who was appointed by Edward I. *Admirallus Maris Regis* A.D. 1297. During the reign of Edward I. there were three admirals in contemporary command of the three coasts of England, one having jurisdiction from the mouth of the river Thames northward, another from the same point westward, and another of the west coast, including the shores of Wales and Ireland.

All admirals in the Royal navy were wont anciently to carry St. George's flag at the head of the topmast, but on the accession of James I. he added to it the cross of St. Andrew, as due to Scotland. The Lord High Admiral alone was

permitted to wear "the cross of the arms of England,"—that is, the standard of England at the main. He had also the power in the sixteenth century to permit another man to wear the bare English flag in the main-top in his presence. Sir Wm. Monson speaks of the *Rear-Admiral* as a recent invention, and says, "The Vice-Admiral wears his flag in the fore-top, being Vice-Admiral, so he is to wear what colored flag he pleases in the main-top as Admiral of a squadron. The Rear-Admiral wears his flag in the mizzen, and every ship besides is to wear a streamer of the same color in the forehead or mizzen-yard to be distinguished from other squadrons."

The Sicilians or Genoese are said to have been the first who, at the beginning of the Crusades, conferred the rank on the commander of a squadron of ships.

"St. Louis" introduced the title into France. The rank of Admiral was formerly equivalent to that of a Marshal of France, and a decree of Phillippe-le-Bel ordains that "each wing of our army must be commanded by a Prince, an Admiral, or a Marshal." It also constituted the fourth dignity of the order of Malta. The admirals of France possessed such great prerogatives that Richelieu suppressed the title, and invested himself with their functions, under the name of "Grand Master, Chief and Superintendent-General of Navigation and Commerce." Louis XIV. revived the title of Grand Admiral in 1669, but he reserved to himself the nomination of the officers and the right of giving orders direct to flag-officers. Notwithstanding these restrictions the privileges attaching to this post were enormous, comprising the nomination of the officers belonging to the naval courts of justice, the delivery of passports, permissions, and furloughs, the countersigning of royal decrees, and the receipt of a tithe of all prize-money and fines levied in admiralty courts. So valuable were these privileges, that when the Duc de Penthierre abandoned his claims to them in 1759, he received in compensation an annual grant of about $30,000, which was regularly paid until the revolution.

The first "Admiral of France" was Florent de Varennes, who, appointed by St. Louis, accompanied his sovereign in the expedition to Tunis; and since his day down to 1791, when the title was abolished by the National Assembly, it was conferred upon 59 different persons.

The most celebrated of these naval commanders were—

Nicolas Béluchét, who seized Portsmouth, England, in 1339;

Jean de Vienne, Seigneur de Clairveaux, who was killed in the battle of Nicopolis;

Gaspard, Comte de Coligny, a victim of St. Bartholomew;

Anne de Joyeusq, a devoted adherent of Henry III., killed at the battle of Contras;

François de Coligny, the eldest son of the murdered admiral;

Charles de Gontaut, Duc de Biron, the trustiest counselor of Henry IV., who was afterwards beheaded for high treason; and

François de Vendôme, Duc of Beaufort, nicknamed "Le Roy des Halles," who, appointed Grand Master of Navigation, was killed at the siege of Candia.

The *Comte de Vermendois* and the *Comte de Toulouse* were also appointed "Admirals of France," one at the age of two, and the other at the age of five, years.

Napoleon, in 1805, conferred the dignity of "Grand Admiral" on Murat; but the post, abolished at the revolution, was merely honorary, and as such was held by the Duc de Angoulême after the Restoration. The title of "Grand Admiral" was finally suppressed after the revolution of 1830.

The French have now the titles of admiral, vice-admiral, and rear-admiral in their navy.

On the establishment of the Continental navy, or a few months later, viz., November 15, 1776, having established the rank and command of the captains the month previous, Congress resolved that an "admiral should rank as a general; a vice-admiral as a lieutenant-general; a rear-admiral as a major-general;" evidently looking to the addition of those ranks to the navy. The prejudices of the people, however, prevented the establishment of such high-sounding titles (?), and, until 1862, no officers were commissioned in the United States navy of higher rank than captain, except in 1859, when, in special compliment to his services, Charles Stewart was commissioned as "Senior Flag-Officer."

The act of July 16, 1862, reorganizing the navy, was the first to recognize the necessity of the grade, and authorized the commissioning of not more than nine rear-admirals on the active list, and nine on the retired or reserved list, the former "to be selected, during the wàr, from those commanders who have distinguished themselves, or shall hereafter eminently distinguish themselves, by courage, skill, and genius in their profession; *Provided*, That no officer shall be promoted to this grade unless, upon recommendation of the President, by name, he has received the thanks of Congress for distinguished service. During times of peace vacancies to this grade shall be filled by regular promotion from the list of commodores, subject to examination as to mental, moral, physical, and professional qualifications." "The three senior rear-admirals were to wear a square blue flag at the mainmast-head, the next three at the foremast-head, and all others at the mizzen." Rear-admirals to have relative rank with major-generals.

The same law authorized nine rear-admirals on the retired list, ranking relatively with major-generals, who were to be selected by the President, by and with the consent of the Senate, "from those captains who have given most faithful service to the country." After these were commissioned, promotion to rear-admiral on the retired list was to be by seniority, subject to an advisory board.

Under this law David G. Farragut, Louis M. Goldsborough, Samuel F. Dupont, and Andrew H. Foote were commissioned July 16, 1862, Charles H Davis and John A. Dahlgren, February 7, 1863, David D. Porter, July 4, 1863, on the active list, and Charles Stewart, William B. Shubrick, Joseph Smith, George W. Stone, Francis H. Gregory, Elias F. Lavallette, S. H. Stringham, Samuel L. Breese, Hiram Paulding, George C. Read, on the retired list. Rear-Admiral George C. Read died on the 22d of August, 1862, the first rear-admiral to die in our navy, and Rear-Admiral Lavallette died on the 18th of November following. Of all the above-named

rear-admirals, in 1880 all were dead excepting Rear-Admiral David D. Porter, then the admiral of the navy.

Under this law, as senior rear-admiral, Farragut hoisted his plain square blue flag at New Orleans, on the mainmast-head of the "Hartford." He received his commission August 12, 1862, and the next morning, on the hoisting of the colors, his flag was run up for the first time at the main, when it was saluted by the whole squadron; soon after which the flag-ship "Hartford," accompanied by the "Brooklyn," proceeded down the river, the remaining ships of the squadron dipping their ensigns as the "flag-ship" passed. This was the first admiral's flag hoisted at the main in our navy. Subsequently the law was amended, and Farragut, as a rear-admiral, retrograded his flag to the mizzen, thence, on his promotion to vice-admiral, advanced it to the fore, and on his promotion to admiral, July 25, 1866, raised it again high up on the main.

On the 21st of December, 1864, the grade of vice-admiral was first introduced into our navy, and Farragut was our first vice-admiral. On his promotion to a full "admiral," July, 1866, Rear-Admiral David D. Porter was made a vice-admiral, and on the death of Farragut, August, 1870, he was made admiral of the navy, and Stephen C. Rowan vice-admiral. Under existing laws, on the death of the present admiral and vice-admiral those grades become extinct in our navy, and rear-admiral will be the highest rank.

At present there are in the United States navy one admiral, one vice-admiral, and eleven rear-admirals on the active list, and forty-two on the retired list, who have been retired for long and faithful service.

An admiral may command a fleet or fleets.

A vice-admiral may command a fleet, or a division of a fleet under the admiral; be commander-in-chief of a squadron; or may command a naval station.

A rear-admiral may command a fleet or squadron, a squadron or division under an admiral or vice-admiral; be chief of staff of a naval force under an admiral or vice-admiral; or may command a naval station.—*George H. Preble, Rear-Admiral U.S.N.*

Admiral. The epithet of *admiral* was formerly applied to any large or leading ship, without regard to flag, and is still used in the whale- and cod-fisheries. The first vessel to arrive in any port in Newfoundland retains this title during the season, the second becomes the *vice-admiral*, and the third the *rear-admiral.*

Admiral. A shell of the genus *Conus.* The varieties are designated as the *grand-admiral*, the *vice-admiral*, the *orange-admiral*, and the *extra-admiral.*

Admiralty. "The Admiralty" means the Lord High Admiral of England, or the commissioners for executing his office, commonly called the Board of Admiralty. It dates from 1512, when Henry VIII. appointed a board of commissioners to examine into and report upon the state of the navy. In 1660, James, Duke of York, became the first Lord High Admiral. On his accession to the throne (1685) the office was put in commission. On the accession of William and Mary (1689) Parliament passed an act legalizing and rendering permanent the board of experts that had from time to time been called upon to administer the affairs of the navy. The office remained in commission till 1702, when George, Prince of Denmark, became Lord High Admiral. The office was again in commission from 1708 to 1827, when William, Duke of Clarence, the "Sailor Prince," became Lord High Admiral. He resigned August 12, 1828. Since then the office has been in commission, and will probably remain so, till the present Duke of Edinburgh is appointed to fill it.

The Board of Commissioners is thus constituted, under Orders in Council, 19th March, 1872:

(1) First Lord of the Admiralty, First Naval Lord, Second Naval Lord, Junior Naval Lord, Civil Lord.

(2) The Parliamentary Secretary, Permanent Secretary, Naval Secretary.

(3) The Comptroller of the Navy, assisted by a Deputy Comptroller, and Director of Dock-Yards.

(4) The First Lord to be responsible to the Crown and to Parliament for all the business of the Admiralty, divided as follows: (*a*) The First Naval Lord, Second Naval Lord, and Junior Naval Lord to be responsible to the First Lord of the Admiralty for the administration of so much of the business relating to the *personnel* of the navy, and to the movement and condition of the fleet, as shall be assigned to them from time to time by the First Lord. (*b*) The Comptroller to be responsible to the First Lord for the administration of so much of the business as relates to the *matériel* of the navy, the Comptroller to have the right to attend the board, and to explain his views, whenever the First Lord shall submit to the board for their opinion designs for ships, or any other matters emanating from the Comptroller's department. (*c*) The Parliamentary Secretary to be responsible to the First Lord for the finance of the department, and for so much of the other business of the Admiralty as may be assigned to him. (*d*) The Civil Lord, the Permanent Secretary, and the Naval Secretary to have such duties as shall be assigned to them by the First Lord. The First Lord is nearly always appointed from civil life.

THE ADMIRALTY, the Navy Office, Whitehall, London.—*S. B. Luce, Captain U.S.N.*

Admiralty Courts (in law). The Constitution declares that the judicial power of the United States shall extend . . . "to all cases of admiralty and marine jurisdiction." By act of Congress a district court of the United States is empowered to sit as an admiralty court for the trial of all ordinary causes originating on the high seas, or on rivers, ports, or harbors communicating with the sea. The more serious cases are referred to the circuit courts, sitting as courts of admiralty.

Admiralty Droits. The revenue arising from enemies' ships detained in prospect of war; from enemies' ships coming into port in ignorance of hostilities; from ships captured by non-commissioned captors; from the proceeds of wrecks and goods of pirates.

Admiralty Midshipman. (*Eng.*) Formerly one who, having served his time and passed his examination, was appointed to a ship by the admiralty, in contradistinction to those who were rated by the captain.

Adonis. An anguilliform fish.

Adornings. The ornamental work on the quarter and stern galleries.

Adown. The bawl of privateersmen for the crew of the captured vessel to go below.

Adreamt. Dozing.

Adrift. Floating at random. The state of a vessel or boat broken from her moorings and driven to and fro by the wind, sea, or tide. Also used of a thing that has broken from its place; as, a gun from the ship's side, etc.

Ad Valorem. In its application to custom duties signifies a duty or tax on importations that is levied with reference to the value of the goods.

Advance. An amount of an officer's salary which he is allowed to receive in advance when ordered on sea-duty. If ordered to the Asiatic Station he may draw three months' pay in advance, and on other sea-duty two months' pay. The advance is paid by navy pay agents, on presentation of the officer's orders, upon which the pay agent must indorse the payment. This indorsement is notice to the paymaster of the vessel to which the officer is ordered, and it is his duty to deduct the advance from the officer's future earnings. Officers ordered to a vessel in a United States port are entitled to receive their current pay up to the date of sailing, without regard to the advance received from the pay agent. Officers receiving an advance are required to give notice thereof in writing to the paymaster of the vessel to which they are ordered. Failure to do so will be deemed scandalous conduct and a violation of general orders.

Advance. To move forward. *Advance*, or *vanguard*, is that portion of a force which moves in front of the main body. *Advance list* is the list on which are registered the names of those who receive advance money. *Advance note* is a note issued by owners of ships, promising to pay a specified sum to a seaman within a specified number of days after he has sailed on a voyage.

Advancement. Promotion to a higher rank or grade.

Advantage, or Vantage-ground, is that which affords the greatest facility in attack or defense.

Adventure. An undertaking involving hazard; used in a commercial sense to signify a speculation in goods sent abroad to be sold or bartered for profit. *A bill of adventure* is one signed by the merchant, in which he takes the chances of the voyage.

Adversary. A term applied to an enemy, but strictly confined to an opponent in single combat.

Adverse. The opposite of favorable; as, an adverse wind or tide.

Advice. Counsel; suggestion. *Advices*, intelligence; news.

Advice-boat. A vessel to carry dispatches. They were first used in 1692, previous to the battle of La Hogue.

Advocate. A counselor; one who pleads the cause of another. See JUDGE ADVOCATE.

Adze, or Addice. A tool for dubbing flat or circular work. It is much used in the East, where it takes the place of axe, plane, and chisel.

Æ. See CLASSIFICATION OF MERCHANT VESSELS.

Æinautæ. Senators of Miletus, who held their deliberations on board ship.

Æratæ. Ancient ships with brazen prows.

Aerator. An apparatus for aërating water. Distilled water has an insipid taste unless it is subjected to the action of the air before being used. The same effect may be obtained by throwing calcareous substances into water confined in an air-tight vessel. An apparatus for fumigating grain.

Aerography. The description of the atmosphere, its nature, properties, limits, etc.

Aerolites. Solid bodies which descend to the earth's surface from beyond the atmosphere. They are composed principally of iron and a small percentage of nickel and cobalt.

Aerolites, meteors, fire-balls, and shooting-stars are classed together as being merely varieties of the same phenomenon. There is but little doubt that aerolites are bodies revolving about the sun like the planets, and are encountered by the earth in its annual motion around the sun. The comets, like the earth, must encounter an immense number of these bodies, and a part of their motion must be thereby destroyed. This effect may be appreciable in the case of periodic comets, though thus far it is inappreciable in the case of the earth and the other planets.

Aerology. The doctrine of air; generally applied to medical discussions respecting its salubrity.

Aeromancy. Formerly, the art of divining by the air. In modern times it means the foretelling of the weather by experience or by instruments.

Aerometer. An instrument for making corrections in pneumatic experiments.

Aerometry. The science of measuring the air, its power, pressure, and properties.

Aeronaut. A navigator of the air.

Aeronautics. The art of navigating the air.

Aerostatics. The science that treats of the equilibrium and pressure of the air and other gases.

Æstuary. See ESTUARY.

Æwul. A basket for catching fish.

Afeard. Afraid.

Afer. The southwest wind of the Latins.

Affair. An engagement of minor importance. *An affair of honor*, a duel.

Affidavit. A written statement attested by the oath of the person making it and subscribed by him. To give the oath legal effect it must be administered by a person thereunto authorized by law, who appends his certificate, technically called a "jurat." An affidavit differs from a deposition in being *ex parte*, the person making it not being subject to cross-examination.

Affirm. To make a solemn promise to tell the truth under the pains and penalties of perjury. To confirm.

Affirmative. The signal, the hoisting of which implies assent.

Affluent. A stream flowing directly into another stream; a more specific term than *tributary*.

Affreightment. A contract for the letting of a vessel, or a part of her, for freight. See CONTRACT OF AFFREIGHTMENT.

Afloat. Buoyed up and supported by the water; on board ship.

Afore. Farther forward, the same as *before*.

Afoul. See FOUL.

Africa. See CONTINENTS.

Aft. Abbreviation of *abaft*. *Right aft*, exactly astern. *To haul a sheet aft*, to pull the rope attached to the clew more towards the stern of the ship.

Aft-castle. In ancient days, a tower erected aft, on the upper deck. See FORECASTLE.

After. Comparative adjective applied to any object in the rear part of a vessel. *After-sails, -yards, -braces, -bowlines,* those on the main- and mizzen-masts. *After-body,* that portion of the ship's body abaft dead flat. *After-clap,* a subsequent unexpected event. *After-end,* the rear end. *After-face,* the rear face.

Afterguard. The men who are stationed on the quarter-deck and poop to man the gear. It is generally composed of landsmen, and they are not required to go aloft except to loose and furl the mainsail.

After-Hood. The aftermost plank in a strake, outside or inside.

Afternoon-watch. The period of time from noon till four o'clock. The men on duty during that time.

After-peak. The contracted part of the hold which lies in the vessel's run; the aftermost portion of the hold.

After-rake. The overhang of the stern.

After-timbers. The timbers abaft the midship section.

Aftmost, Aftermost. The objects nearest the stern.

Aftward. Towards the stern.

Aga. A superior Turkish officer.

Against the Sun. See WITH THE SUN.

Agal-Agal. One of the sea fuci. It derives its name from Tanjong Agal, on the coast of Borneo. It is thought the material for edible birds'-nests is derived from this fucus.

Agare. The American aloe from which cordage is made.

Age. In chronology, a period of a hundred years.

AGE OF THE MOON. The time elapsed since the last conjunction.

AGE OF THE TIDE. The interval between the transit of the moon at which a tide originates and the appearance of the tide itself. Called also *Retard of the Tide.*—See TIDE.

Agea. The horse-block or grating on ancient boats from which the captain gave his orders.

Agent. One intrusted with the business of another. See LLOYD'S AGENTS.

COMMERCIAL AGENT, a United States consular officer. These officers are peculiar to the United States, and are not regarded by other powers as entitled to the rank and privilege of consuls.

Agent, Navy Pay. An officer of the pay corps in charge of a navy pay office. His duties are to advertise for and purchase all supplies required by the Navy Department and its bureaus for the use of every branch of the navy; to pay mileage and traveling expenses of officers traveling under orders; to make advances to officers ordered to sea; to pay allotments; to furnish transportation for enlisted men; to pay certificates of indebtedness issued by the Fourth Auditor to claimants, and to act as a general disbursing agent for the Navy Department. He renders complete quarterly returns to the Fourth Auditor. Navy pay offices are established in Boston, New York City, Philadelphia, Baltimore, Washington, Norfolk, and San Francisco.

Aggression. The first act in provoking hostilities.

Agon. A Chinese cymbal. See GONG.

Agreement. (*Eng.*) In vessels of more than eighty tons the master must enter into an *agreement* with every seaman on board, and that agreement must be in the form sanctioned by the Board of Trade.

RUNNING AGREEMENT is an agreement extending over several voyages when they are less than six months in duration.

Aground. The situation of a ship when she touches or rests on the bottom.

Aguada. The Spanish and Portuguese term for a watering-place.

Ahead. Farther onward, or immediately before the ship.

AHEAD OF THE RECKONING. Beyond the position as determined by logging.

Ahold. To lay a ship *ahold* is to bring her to lie as close to the wind as possible.

Ahoo. Awry, aslant, lopsided.

Ahoy. An exclamation used in hailing a ship; as, *ship ahoy!* It means literally *stop.*

Ahull. A ship under bare poles, with her helm lashed a-lee, lying nearly broadside on to the wind and sea.

Aich's Metal. See GUN-METAL.

Aid. Assistance.

Aid. (See EXECUTIVE OFFICER.) An officer not above the rank of lieutenant on the personal staff of the commander-in-chief, and under the immediate direction of the chief of staff to perform such duties as may be assigned him, including that of secretary.

The commanding officer of a vessel is empowered to detail a junior officer to act as his personal aid.

There is attached to each navy-yard or station an officer not above the grade of commander, who is called senior aid to the commander, who acts as his principal aid in regard to the duties of the yard.

Aigre. The sudden flowing of the sea. See BORE.

Aiguade. (*Fr.*) Water for ship's use.

Aiguilletes. (*Fr.*) Tagged points or cords worn across the breast on some uniforms.

Ailettes. Small plates of metal placed on the shoulders on mediæval armor, the prototype of the modern epaulet.

Aim. The pointing of a weapon at the target. An order to point the weapon at the object.

Aim-frontlet. (*Obsolete.*) A piece of wood hollowed out to fit the muzzle of a gun so as to give a line of sight parallel with the axis of the bore.

Air. The atmosphere; the fluid which we breathe.

To AIR. To dry; to ventilate.

Air-bladder. A peculiar organ in some kinds of fishes by which they maintain their equilibrium in the water.

Air-blast. A current of air induced by a blower. See BLOWER.

Air-casing. A sheet-iron casing around the smoke-stack to protect the deck.

Air-chamber. A cavity containing air to act as a spring for equalizing the flow of a liquid in a hydraulic machine. See ORDNANCE.

Air Engine. An engine put in motion by hot air instead of steam; a caloric engine.

Air-funnel. A cavity formed by the omission of a timber in the upper works to admit fresh air into a ship's hold and convey the foul air out.

Air-furnace. A furnace with a natural draft and no blast.

Air-gun. A pneumatic machine for propelling projectiles. They have been constructed to carry as far as an ordinary musket.

Air-hole. A cavity in a casting formed by bubbles in the molten liquid. A vent-hole in a mold. A hole in the ice. A draft-hole in a register. A small hole in a cask to admit air when the faucet is turned on.

Airing Stage. A platform on which gunpowder is aired and dried.

Air-jacket. A garment capable of being inflated and used as a life-preserver.

Air-pipe. Funnels for clearing ships' holds of foul air. A small pipe leading from the hot well outboard.

Air-port. A scuttle cut in the bow, stern, or sides of a ship to admit air and light.

Airs. Light breezes.

Air-scuttle. A scuttle cut in the deck or grating for the admission of air.

Air-thermometer. An instrument in which the contraction and expansion of the air measure the temperature.

Air-tube. A small tube suspended in the coal-bunker for the purpose of ascertaining the temperature of the coal, as a precaution against spontaneous combustion.

Air-valve. See VACUUM-VALVE.

Akreyri. A town of Iceland, on the Eyiafiord. Lat. 65° 40′ N.; lon. 18° W. It has an excellent harbor.

Akyab. A town and seaport of British Burmah, in Aracan, on the E. side of the island of Akyab. It has an excellent harbor. Pop. 15,281.

Alamak. γ Andromedæ.

Alamottie. Mother Cary's chicken; the storm finch; the stormy petrel.

Aland. An old word for ashore, or to land.

Alarcon, Hernando de. A Spanish navigator of the 16th century, to whom we owe the first precise knowledge of California. He sailed May 9, 1540, in the service of Spain, missed a junction with the expedition of Coronado on the western coast of America, and, returning to New Spain in 1541, drew up his maps and observations. His discoveries, and those of Ulloa, were so complete that the map of California of 1541 differs little from that made in our own day.

Alarm. Any sound or information intended to give notice of approaching danger.

FALSE ALARM. An alarm which had no foundation in fact, being given through misapprehension, or through design, in order to exercise the men at their duties.

Alarm-gauge. A contrivance in the steam-engine for showing when the pressure of steam is too high or the water in the boiler too low.

Alarm-gun. A gun fired to give an alarm.

Alarmist. One who habitually excites alarm; one who is given to finding causes for alarm.

Alarms, Marine. Fog-bells, trumpets, horns, and whistles operated by the waves, winds, tides, currents, or by clock-work.

Alarms, Nautical. Contrivances on board ship to indicate a leak or the accumulation of bilge-water.

Albany-beef. A name for the sturgeon.

Albatross. A large sea-bird belonging to the genus *Diomeda.*

Alberton. A seaport town of Prince Edward Island. The port, called Cascumpeque, or Holland Harbor, is the best on the northern side of the island. Pop. 600.

Albion. A name for England, from the whiteness of the cliffs.

Alburnum. The slab-cuts of timber; the sapwood.

Alcatraz. The pelican.

Aldebaran. A star of the first magnitude, popularly known as the Bull's-eye. It is the bright star in the group of five called the *Hyades,* and is conspicuous by its ruddy color. See TAURUS.

Alden, James, Rear-Admiral U.S.N. Born in Maine. Appointed midshipman from same State, April 1, 1828.

Promoted to passed midshipman, June 14, 1834; navy-yard, Boston, 1835; exploring expedition around the world, 1838–42.

Commissioned as lieutenant, February 25, 1841; naval station, Boston, 1843; frigate "Constitution" around the world, second time, 1844–46; while attached to this vessel, commanded a boat expedition and cut out several war junks from under the guns of the fort at Zuron Bay, Cochin-China; home squadron during Mexican war; present at the capture of Vera Cruz, Tuspan, and Tobasco; naval station, Boston, 1847; coast survey, 1848–60; made a reconnoissance of all the West coast. In the winter of 1855–56, during the Indian war in Puget Sound, volunteered with the surveying steamer "Active" to co-operate with the army, and rendered important aid in bringing the war to a close; by his timely arrival in the spring of the same year at San Juan Island, prevented a collision between the British naval forces and the United States troops; assisted in landing troops enough to hold the island in dispute against the threatened attack of the British.

Commissioned as commander, September 14, 1855; commanding the steamer "South Carolina" at the commencement of the rebellion, May, 1861; reinforced Fort Pickens, while blockading Galveston, Texas; had a fight with the batteries in the rear of the city; while there, captured thirteen schooners laden with merchandise; commanded sloop "Richmond" at the passage of Forts Jackson and St. Philip and the engagement with Chalmette batteries and defenses of New Orleans; passage of Vicksburg batteries twice; Port Hudson, 1862–63.

Commissioned as captain, January 2, 1863; commanded steam-sloop "Brooklyn" in the action with Forts Morgan and Gaines and the rebel gunboats in Mobile Bay; commanded two attacks on Fort Fisher. Capt. Alden took a prominent part in all the great naval battles of the war, and was handsomely mentioned in the official reports.

Commissioned as commodore, July 25, 1866; commanding steam-sloop "Susquehanna," special service, 1867; commanding steam-frigate "Minnesota," special service, 1867–68; commandant navy-yard, Mare Island, California, 1868–69; Chief of Bureau of Navigation and Detail, Navy Department, 1869–71; promoted to rear-admiral, 1871; commanding European Squadron, 1872; retired, 1873; died, 1877.

A-lee. The contrary of *a-weather.* The position of the helm when the tiller is put over to the lee side of the ship.

HELM'S A-LEE. The order to let go the head-sheets when the helm is down.

Alert. Watchful; vigilant; on the look-out, and ready for any emergency.

Alewife. A fish of the herring kind.

Alexandria. A celebrated city and seaport of Egypt, near the westernmost branch of the Nile, on the Mediterranean, 112 miles N.W. of Cairo. Alexandria has a large naval arsenal, naval and military hospitals. The city has an excellent new artificial harbor, formed by a breakwater, mole, and quays. It has regular steam communication with all the great Mediterranean ports, and is the great emporium of Egypt. Pop. 220,000.

Alexandria. A city and port of entry in Virginia, on the right bank of the Potomac, 7 miles below Washington. The river here is a mile wide, and forms a commodious harbor sufficiently deep for the largest ships. Pop. 14,000.

Alexiacus. An appellation of Neptune.

Alfondiza. The custom-house at Lisbon.

Alga. A species of millepora.

Algæ. Flowerless, cryptogamic plants, cellular, found chiefly as sea-weeds, but also in rivers, marshes, springs, hot and cold, and moist places everywhere. About 2000 species are known and have been described, and among these there is a great variety of forms. Some are attached to rocks, and others are entirely free. None of them have proper roots, but merely processes for their attachment to the surfaces on which they are fixed. They derive their sustenance exclusively, it would seem, from the medium surrounding them, in which respect, as well as in their composition, they differ from fungi. Their substance consists chiefly of vegetable gelatine, soluble in boiling water; the harder parts of their fronds are sometimes leathery, or horny, or cartilaginous, but never really ligneous. They are composed entirely of cells, some consisting of one cell only; the composite ones are easily separable, and the individual cells are generally capable of independent existence, as in the case of the proto-coccus, or red snow plant. The spores and fronds of algæ are frequently of the same color, the most common colors being brown, or orange-brown, rose color approaching red, or green. Algæ are multiplied by division of cells and by spores. Fertilization is effected by conjugation or union of cells, the contents of one passing into another and giving rise to germinating spores. This is seen in the confervæ of stagnant ponds. Other algæ are fertilized by moving filaments or spermatozoids. Others contain a rudimentary cell which, by contact with spermatozoids, becomes a spore and then a new plant. There are also zoöspores which move about in the water, the cells ultimately bursting and scattering them, and the cilia by which they moved disappearing as the spores become fixed. Many of the algæ supply nutritious food, others are of value as yielding barilla, an impure carbonate of soda largely used in manufacturing, and all are useful as manure. Some species are of immense length and size, such as *Macrocystis pyrifera*, *Lessonia fuscescens*, and *D'Invillea utilis*, which are found hundreds of feet long and as thick as the human body. More frequently, however, they are small, varying from a few inches to several feet in length, while some species are visible only through the microscope. The distribution of algæ as to depth varies; their actual depth is still a disputed point with naturalists. It is impossible in the present state of knowledge to estimate their extreme limit, but *vegetation*, as usually understood, is practically limited to depths under 100 fathoms. Very few of the higher algæ live, even occasionally, on the surface of the sea; a notable exception is the gulf-weed, so called (*Sargassum bacciferum*), which see.

Algeciras. A seaport town of Spain, on the W. side of the Bay of Gibraltar, opposite to and 6 miles W. of Gibraltar. Pop. 14,000.

Algenib. γ Pegasi.

Algere. A spear used by fishermen in olden times.

Algiers. A city of North Africa, on the W. side of a bay of its own name. Lat. 36° 47′ 3″ N.; lon. 3° 4′ 5″ E. The harbor has a mole 580 feet in length by 140 in width, extending from the mainland to an inlet, on which are a strong castle with batteries and a light-house. Pop. 54,000.

Algol. A variable star in Perseus.

Algorab. α Corvi, but its brightness of late is rivalled by β Corvi.

Alibi. The Latin word meaning elsewhere. Before courts-martial, as well as in those of civil jurisdiction, when an accused person proves that at the time of the commission of the alleged offense he was somewhere else than at the scene of the offending, he is said to have proven an *alibi*.

Alicante. A city and seaport of Spain, located at the head of an extensive bay. Lat. 38° 27′ 7″ N.; lon. 0° 26′ W. The harbor is only a roadstead in a deep bay, small vessels alone being able to approach the quay. Pop. 30,000.

Alidade. The movable arm of an instrument fitted with sights or a telescope.

Alien. (Lat. *alienus*, belonging to another, foreign.) In England, by the common law, an alien was one born out of the king's dominions or allegiance. The only exceptions to this rule were such children of the king as might be born abroad, and the children of his ambassadors so born. By several statutes, to wit: 25 Edw. III., passed in 1350; 29 Charles II., 1676; 7 Anne, 1708; 10 Anne, 1711; 4 Geo. II., 1731; 13 Geo. III., 1773; 7 and 8 Vict., 1844, the common law rule has been altered, so that now all children born out of the king's allegiance whose fathers (or grandfathers by the father's side) or whose mothers were natural-born subjects, are deemed to be natural-born subjects themselves, unless their said ancestors were attainted or banished beyond sea for high treason, or were at the birth of such children in the service of a prince at enmity with Great Britain.

In this country an alien is one born out of the limits and jurisdiction of the United States. The children of fathers, however, who at the time of such children's birth were citizens of the United States, and had resided in the United States, are, notwithstanding the fact of being born abroad, citizens. An alien becomes a citizen by naturalization (which see). In time of war a valid contract cannot be made between a citizen and an alien enemy, nor can such a contract be enforced after peace has been declared. During a war an alien enemy cannot prosecute an action of any

kind in the courts of the United States; his right of action, however, revives on the declaration of peace. See INTERNATIONAL LAW.

Alignment. An imaginary line to regulate the formation of a squadron.

Alioth. The star ϵ *Ursæ Majoris.*

All. The whole; quite.

ALL AGOG. In a flurry of excitement.

ALL AHOO. Confused; awry; aslant.

ALL-A-TAUNT-O. Fully rigged with masts an-end, yards crossed, and rigging rove.

ALL HANDS. The whole ship's company.

ALL HANDS! The boatswain's summons for the whole crew, in distinction from the watch.

ALL READY FORWARD, ALL READY THE MAIN, etc. The notice that a particular part of the ship is ready for the next order.

ALL STANDING. Fully equipped. *To be brought up all standing* is to be suddenly stopped without any preparation.

ALL'S WELL. The sentry's call as each bell is struck, from tattoo to reveillé.

ALL TO PIECES. Out-and-out; excessively.

ALL WEATHERS. All times and all seasons.

ALL IN THE WIND. The sails shivering.

ALL OF A HEAP. Dumfounded; confused.

STERN ALL. The shout of the harpooner when the fish is struck.

HAUL OF ALL. To swing all the yards at the same time.

ALL UP AND AFT. The report of the officer of the deck when the officers and men are assembled on the quarter-deck ready for muster.

Allan. A piece of land nearly surrounded by water.

Allege. (*Fr.*) A ballast-boat.

Allegiance. The tie which binds the citizen to his sovereign or country. Its full consideration involves an examination of the right of a citizen to expatriate himself, a matter about which there is a conflict of theories. The common law of England denies the right of the subject to throw off his allegiance to the country of his birth, and European nations generally have taken the same position, while in the United States we require of persons seeking naturalization the renunciation of their former allegiance. The inherent difficulties of the subject make it improbable that any solution will ever be attained by legislative action, but it may be assumed that the sense of humanity of enlightened nations at this day will prevent being treated as criminals, persons who, by the silent acquiescence, and, therefore, the presumed consent of the country of their birth, have removed to other countries and assumed a new allegiance, even if they should be taken in arms against their native country. Many of the questions growing out of the subject have been disposed of by treaties between the United States and foreign nations. See NATURALIZATION.

Alley. A passage-way between the tiers of tanks in a magazine. (See MAGAZINE.) A passage-way affording means of access to the propeller-shaft.

Alliance. A league between two or more friendly powers, either offensive and defensive, or defensive only.

Alligator. The American crocodile.

Alligator Water. The muddy, brackish water near the mouth of tropical rivers.

Allision. Synonymous with *collision*, but is sometimes used to mark a distinction between one vessel running into another, and two vessels striking each the other.

Allotment. That part of the pay of a person on duty in a United States vessel which is paid during his absence to some person on shore. Allotments may be granted by any officer, or, with the approval of the commanding officer, by any man or petty officer in a vessel in commission. They are paid by navy pay agents to the allottees on the last day of every month, and the paymaster of the vessel at the same time deducts the amount of the allotment from the allottor's pay. The allottee must be a member of the allottor's family, or some person who receives the money for the benefit of said family. Allotments cannot exceed one-half the allottor's monthly pay. It is the duty of the paymaster having charge of the allottor's account to deduct as much from his pay as is paid on the allotment, and, in case of death, desertion, or discharge of the allottor, to give notice to the navy pay agent to cease payments to the allottee. The Fourth Auditor keeps a register of all allotments, the amounts paid to the allottees, and the amounts checked from the pay of the allottors. In case more is deducted from the pay of an allottor than is paid to the allottee, the difference will be paid to the former on application to the Fourth Auditor.

Allowance. Reimbursement of incidental expenses or losses incurred in the performance of duty; as, traveling allowance, allowance to paymasters for loss on clothing, small stores, etc. A gratuity or bounty; as, allowance of additional pay on re-enlistment. A commutation; as, allowance for the subsistence of pilots in officers' messes. A ration or fixed quantity of food. It is double, full, two-thirds, half, or short, according to circumstances. (*Commercial.*) A customary deduction from the gross weight of goods, varying in different countries.

Alloy. A combination of metals by fusion. The term is also applied to the metal that is mixed with gold or silver. The properties of the *alloy* are very different from the mean of the properties of the constituents, the *alloy* being harder, more tenacious, less ductile, fusing at a lower temperature, and more easily oxidized. Its density may be either greater or less than this mean, and its power of conducting electricity is less. If mercury enter into a combination, it is known as an *amalgam.*

Alluvion, or Alluvium. A deposit of earth, gravel, etc., along shores or banks, caused by the washing of the water, or by the precipitation of substances held in solution. Sea alluvions differ from those of rivers in that they form a slope *toward* the land.

Ally. A confederate. A prince or state united to another by treaty. See ALLIANCE.

Almacantars. Circles parallel to the horizon, and passing through every meridian.

ALMACANTARS STAFF. An old instrument of 15° of arc to observe the amplitude.

Almady. A canoe made of bark, used by the natives of Africa for war purposes. The name is also applied to a boat in use at Calcutta, often measuring from 80 to 100 feet in length, and generally from 6 to 7 feet in breadth.

Almafadas. Large dunnage cut on the coast of Portugal.

Almanac. A calendar of the days and months of the year, to which is generally added a record of the feast-days and celestial phenomena.

Almanac, The Nautical. As the astronomical ephemeris had its origin in the necessity for easy and accurate prediction of the phenomena and configurations of the heavenly bodies, so the nautical almanac originated in connection with the necessity for safe and speedy navigation. So soon as out of sight of land the navigator has but one sure means of information as to his position at sea; his compass gives him only the direction in which his ship lies or is sailing; he must rely upon the heavens alone for the precise determination of his position; and the problem of longitude and latitude is capable of solution only in connection with some *prediction* (a suitable period in advance) of the absolute positions of the bodies observed at the time when the observations are made upon them. This annual volume of such *predictions of the positions of the heavenly bodies as are necessary in the navigation of ships* constitutes the nautical almanac. In general, these predictions are given for equidistant intervals of time, so that by interpolation the position of a single body, or the relative position of two bodies, may be readily computed for any intermediate epoch. Long before the publication of the first nautical almanac, books of predictions, known as ephemerides, had been issued from time to time, at irregular intervals, mostly for the convenience of astronomers. It required simply a regulation and extension of the idea of these volumes to make up a nautical almanac. The nautical almanac proper had its origin with the English nation about the middle of the 18th century. It owes its existence to a memorial presented to the Commissioners of Longitude, on February 9, 1765, by Dr. Maskelyne, in which, after stating many facts and experiments to prove the utility of the lunar method of obtaining the longitude at sea, he concludes, that "nothing is wanting to make this method generally practicable at Sea but a Nautical Ephemeris." Dr. Maskelyne proposed the construction of such a "Nautical Ephemeris" from the "New and Correct Tables of the Motions of the Sun and Moon," by Tobias Mayer. The first volume issued was that for the year 1767. Gradually additions were made to the nautical almanac, and improvements introduced, mostly, however, in the direction of such predictions and ephemerides as were of more service to the astronomer than to the navigator, and the volume assumed the name of "The Nautical Almanac and Astronomical Ephemeris," which title it retains to the present day. The most important era in the history of the nautical almanac is marked by the "Report of the Committee of the Astronomical Society of London relative to the Improvement of the Nautical Almanac," adopted November 19, 1830. One very great improvement consisted in the abolition of the use of apparent time in all the computations of the nautical almanac, and the substitution of mean time therefor. (See EPHEMERIS, THE ASTRONOMICAL.) The entire almanac was remodeled by this committee; and the new arrangement of the several ephemerides therein contained has formed the basis of all subsequent nautical almanacs, and has remained unchanged in the "British Nautical Almanac" up to the latest volume,—that for the year 1883. "The American Nautical Almanac" had its origin nearly a century after the "British Nautical Almanac." On March 3, 1849, an act of Congress was approved providing for the preparation of such a work. The preparation of the first volume—that for the year 1855—was begun in the latter part of 1849, and the series of volumes is unbroken down to the present time, the volume for 1883 having just been issued. By act of Congress, "The meridian of the observatory at Washington shall be adopted and used as the American meridian for astronomical purposes, and the meridian of Greenwich shall be adopted for all nautical purposes." This law was the occasion of the subdivision of "The American Ephemeris and Nautical Almanac" into two distinct parts, and the publication of two separate volumes. Part the first is substantially identical with that portion of the "British Nautical Almanac" intended for the special use of navigators, and is likewise computed for the meridian of Greenwich. This part contains all the data necessary in the navigation of ships, and is published three years in advance of the year for which it is computed. "The American Nautical Almanac" likewise contains accounts of the transits of Mercury and Venus, and of eclipses of the sun and moon, with engraved diagrams of the solar eclipses. Each volume contains also an article on the arrangement and use of the various ephemerides, and a selection of subsidiary tables, of frequent use to the navigator.—*D. P. Tod.*

Almath. The star in Aries whence the first mansion of the moon takes its name.

Almeria. A city and port of Spain, in Andalusia, on the Mediterranean, 104 miles E. of Malaga. In the bay there is a good anchorage, in 12 and 14 fathoms. Pop. 30,000.

Almirante. (*Sp.*) Admiral.

Almury. The upright part of an astrolabe.

Almy, John J., Rear-Admiral U.S.N. Born in Rhode Island in the year 1815. Appointed from that state as midshipman, February 2, 1829; attached to the "Concord," Mediterranean, 1830–32; "Ontario," coast of Brazil, 1833–34; promoted to passed midshipman July 3, 1835; receiving-ship at New York, 1836–37; "Cyane," Mediterranean, 1838–41.

Commissioned as lieutenant, March 8, 1841; brig "Bainbridge," West Indies, 1842; frigate "Macedonian," coast of Africa, 1843–45; line-of-battle ship "Ohio," Gulf of Mexico and Pacific Ocean during the Mexican war and after the war, 1846–50; participated in the siege and capture of Vera Cruz and the capture of Tuspan; latter part of the war—1848—on the Pacific coast, and commanded one of the forts at Mazatlan during the naval occupation of that place; coast survey in 1851–56, on the survey of Chesapeake Bay and the sea-coast of Virginia and North Carolina; commanding "Fulton," on the coast of Central America, in 1857, when General Walker and his filibustering party surrendered to Rear-Admiral Paulding, on board of that vessel, at Nicaragua. Commanded the "Fulton" in the expedition to Paraguay in 1858–59; at navy-yard, New York, 1860–61.

Commissioned as commander, April 24, 1861; commanded "South Carolina," South Atlantic Squadron, 1862–63; "Connecticut," North At-

lantic Squadron, 1864; "Juniata," South Atlantic Squadron, 1865.

While in command of the "Connecticut," captured and sent in four noted blockade-running steamers with valuable cargoes; ran ashore and destroyed four others.

Commissioned as captain, March 3, 1865; commanded "Juniata" in a cruise to the South Atlantic (coast of Brazil and south coast of Africa), 1865-67. While on the coast of Brazil rescued the Brazilian brig "Americo" and crew from shipwreck, attended with great danger, for which service received the thanks of His Imperial Majesty the Emperor of Brazil. Ordnance duty at the navy-yard, New York, 1868-69.

Commissioned as commodore, December 30, 1869; chief signal-officer of the navy at Washington, 1870-72.

Commissioned as rear-admiral, August 24, 1873, and the following month took command of the United States naval forces in the Pacific Ocean. While at Panama, in October, 1873, a serious and violent revolution broke out, characteristic of that country, which continued for three weeks. The city of Panama and the Panama Railroad were in imminent danger of being destroyed. A force of seamen and marines numbering 200, under competent officers, was landed from the ships and kept on shore until the revolution terminated, affording efficient protection to the railroad, to American and to European interests. Two United States vessels, the flag-ship "Pensacola" and the "Benicia," were the only men-of-war in port. Passengers, freight, and specie continually passed over the road in safety and without interruption.

For these services Rear-Admiral Almy received the thanks of the Panama Railroad Company, the Pacific Mail Steamship Company, and of all the consuls and the foreign merchants at Panama.

Was in command of the United States naval forces in the Pacific for two years and ten months.

Has performed altogether twenty-seven years and ten months' sea service; shore, or other duty, fourteen years and eight months.

In April, 1877, was retired, having reached the age prescribed by law for retirement.

Alnus Caver. Early English transports, so called from the wood of which they were made.

Aloft. Overhead; on high; anywhere about the upper masts, yards, or rigging. See ALOW.

LAY ALOFT! The command to the men to run up to their stations.

ALOFT THERE! The hail to men on the yards and in the rigging.

ALOFT is used in a figurative sense for heaven.

Alonde. An old word for ashore; on land.

Along. Lengthwise.

ALONG OF. With.

LYING ALONG. Heeling over to leeward under a press of sail with a beam wind.

LYING ALONG THE LAND. Skirting the shore.

Alongshore. A nautical phrase signifying along the coast, or a course which is in sight of the shore. See 'LONGSHORE.

Alongst. In the middle of the stream, moored head and stern.

Aloof. At a distance.

Alow. Below. All sail *alow and aloft* is all plain sail and stun'-sails.

Alphabet Telegraph. An apparatus which marks symbols on paper, in contradistinction to those whose signals are made by a needle, mirror, or sound.

Alphard. The star *α Hydræ*.

Alpheratz. *α Andromedæ*.

Altair. *α Aquilæ*.

Altar. A step of a dry-dock.

Alternate. To happen or act by turns.

ALTERNATING WINDS. Blow for a time in one direction, and suddenly, from an alteration of the temperature, change and blow in the opposite directions. See MONSOON and BREEZE.

Altiscope. An instrument which enables an observer to look over an intervening object. This instrument has been applied, not very successfully, to pointing guns, the observer being on the deck below.

Altitude. Height. Angular distance of a heavenly body above the horizon measured on a great circle.

ALTITUDE, CIRCLES OF. Great circles of the celestial concave perpendicular to the horizon, and so called because "altitudes" are measured on them. They all pass through the poles of the horizon, of which the superior is the "vertex" of the visible heavens, and hence they are also called "*Vertical Circles*," or simply "*Verticals.*" In a polar system of horizon co-ordinates they are termed "*Circles of Azimuth*," as marking out all points that have the same "azimuth."

ALTITUDE, CIRCLES OF EQUAL. Circles on the earth's surface, from every point of each of which a given heavenly body is observed to have the same altitude at any given time. The circle of equal altitude is a great circle of the sphere when the body is in the horizon, or its altitude 0; the circle is reduced to a point when the body is in the zenith, or its altitude 90°; and between these two limits the parallels are small circles whose radii correspond to the complements of the altitude. A small arc of a circle of equal altitude, when projected on a Mercator's chart, will be approximately a straight line, especially if the altitude of the body be low. Such a line is called "*A Line of Equal Altitude.*" The determination of one or two such lines intersecting each other forms the basis of what is called "Sumner's Method" of finding a ship's position at sea.

ALTITUDE, CORRECTION IN. The total correction to be applied to the apparent altitude to deduce the true altitude. In the case of the stars, it is due solely to refraction, but for appreciably near bodies to the combined effects of refraction and parallax.

ALTITUDE, A DOUBLE. Two altitudes taken for the solution of the same problem. The ordinary problems for which the method furnishes the data are finding the latitude, and rating a chronometer. These altitudes may be of the same body, taken at different times, either both on the same side or on opposite sides of the meridian; or of different bodies similarly situated observed at the same time; or, lastly, of different bodies similarly situated observed at different times.

ALTITUDE, MERIDIAN. The altitude of a celestial body when on the meridian. In the case of a circumpolar star, whose whole diurnal circle is completed above the horizon, the body comes to the meridian twice, when its altitudes are spoken of respectively as "the Meridian Altitude below the Pole," and "the Meridian Altitude above the Pole"; the former is the lowest altitude the body

has in its revolution, the latter the highest. The meridian altitude is easily observed at sea with a sextant, and furnishes the simplest and most satisfactory method of determining the latitude, the declination of the body only being required in addition.

Altitude, Motion in. An instrument is said to move "in altitude" when it is turned on a horizontal axis; in contradistinction, it is said to move "in azimuth" when it is turned on a vertical axis. An azimuth and altitude instrument admits of both motions.

Altitude, Observed, Apparent, and True. The altitudes of heavenly bodies are observed from the deck of a ship at sea with the sextant. Such an altitude is called the "*Observed Altitude.*" There are certain instrumental and circumstantial sources of error by which this is affected: the sextant (supposed otherwise to be in adjustment) may have an index error; the eye of the observer being elevated above the surface of the sea, the horizon will appear to be depressed, and the consequent altitude in reality too great; and one of the limbs of the body may be observed instead of its centre. When the corrections for these errors and method of observing are applied—the "index correction," "correction for dip," and "semi-diameter"—the observed is reduced to the "*Apparent Altitude.*" But again, for the sake of comparison and computation, all observations must be transformed into what they would have been had the bodies been viewed through a uniform medium, and from one common centre,—the centre of the earth. The altitude supposed to be so taken is called the "*True Altitude*"; it may be deduced from the apparent altitude by applying the corrections called "correction for refraction" and "correction for parallax." "Correction for refraction": when a body is viewed through the atmosphere, refraction will cause the apparent to be greater than the true altitude; hence the correction for refraction is subtractive in finding the true from the apparent altitude. "Correction for parallax": the position of the observer on the surface, especially for near bodies, will cause the apparent to be less than the true altitude; hence the correction for parallax is additive in finding the true from the apparent altitude.

Altitude, Parallels of. Lesser circles of the celestial sphere parallel to the horizon. They mark all the points of the heavens which have the same altitude. The Arabic term for this system was "*Almacantars.*"

Altitude, Reduction of, to another Place of Observation. See Run.

Altitudes, Circummeridian. When the body is near the meridian, and altitudes are observed with a view of solving problems by first finding from these the meridian altitude, such altitudes are conveniently distinguished as *Circummeridian Altitudes.*

Altitudes, Equal. Double altitudes of the sun, when at the same altitude in the forenoon and afternoon.

Altitudes, Equation of Equal. In equal altitudes of the sun, its declination changes slightly in the interval between the forenoon and afternoon observation, and therefore the hour-angles corresponding to the two altitudes are not exactly equal. Hence half the interval added to the time of the first observation requires a correction in order to give the time shown by chronometer when the sun is on the meridian. This correction is called "The Equation of Equal Altitudes." It is given in tables.

Altitudes, Simultaneous. Double altitudes of different bodies taken at the same time.

Altometer. The theodolite.

Altona. A city and free port of Prussia, in Holstein, on the right bank of the Elbe, a little below Hamburg. It is accessible to sea-going vessels, and has a large trade. Pop. 90,000.

Aluffe, or Aloof. A very old form for *luff.*

Alveus. An ancient boat made of a single trunk; a dug-out.

Amadas (or Amidas), Philip, b. Hull, 1550; d. England, 1618. A commander of one of the vessels sent out by Sir Walter Raleigh, with Barlow, to take possession of lands on the eastern shore of America. He discovered Ocracoke Inlet, and landed on Wocoken Island, in Florida, subsequently exploring Pamlico and Albemarle Sounds and Roanoke Island. The title of admiral was conferred upon him, and he was united with Lane in the settlement of North Carolina, afterwards called Virginia.

Amain. With force or vigor; all at once; as, *lower amain.* An old word for *yield.* The lowering of the topsail was called *striking amain,* and it was demanded by the *wave amain,* or the brandishing of a sword.

Amalfi. A city and seaport of Italy, in the Gulf of Salerno, and 23 miles S.E. of Naples. Lat. 40° 38′ N.; lon. 14° 37′ 10″ E. A naval school is located at Amalfi. Pop. 6500.

Amalgam. A compound of mercury with another metal. See Alloy.

Amalphitan Code. The oldest code of modern sea laws, compiled during the first Crusade by the people of Amalfi, in Italy.

Amaye. Sea-marks on the French coast.

Ambassador. A diplomatic officer of the highest rank. A practical joke, in which the victim is unmercifully ducked.

Amber. A hard, resinous, vegetable substance, generally of a bright yellow color, and translucent.

Ambergris. A fragrant substance, the origin of which was long a matter of dispute. It is now known to be a morbid product developed in the intestines of the sperm whale. It is of a grayish color, very light, and fusible, and is used as a perfume and as a cordial.

Amelioration. An allowance made to the neutral purchaser, on reclaiming a ship improperly condemned, for the repairs she has undergone at his expense.

America. See Continents.

Americus Vespucci. See Vespucci.

Amidships. The middle part of a ship, whether in regard to her length or breadth, but more generally applied to the axis or fore-and-aft line.

Ammen, Daniel, Rear-Admiral U.S.N. Born in Ohio, May 15, 1820. Appointed midshipman, July 7, 1836; attached to the Exploring Expedition, 1837–38; sloop "Levant" and "Vandalia," in the West Indies, 1838–39; sloop "Preble," on the coast of Labrador and in the Mediterranean, 1840–41; returned to the United States on board ship-of-the-line "Ohio," 1841, and to Naval School; passed examination, June, 1842,

and received warrant of passed midshipman; store-ship "Lexington," as navigator, 1843–44, to the Mediterranean; sloop "Vincennes," as navigator, East India Squadron, 1845–47; coast survey, 1848–49.

Commissioned as lieutenant, November 4, 1849; frigate "St. Lawrence," Mediterranean Squadron, 1850; coast survey, 1851; attached to a commission for selecting a naval station in the Bay of San Francisco, Cal., 1852; scientific expedition of steamer "Water Witch," Paraguay River, 1853–54; brig "Bainbridge," Brazil Squadron, 1854–55; Naval Observatory, Washington, 1856–57; steam-sloop "Saranac," Pacific Squadron, 1858; steam-frigate "Merrimac," Pacific Squadron, 1859–60; steam-frigate "Roanoke," as executive-officer, North Atlantic Blockading Squadron, 1861; commanding "Seneca," South Atlantic Blockading Squadron, 1861–62, at battle of Port Royal, November 7, 1861; the day following hoisted our flag over Fort Beauregard, and made formal delivery to the army, by order of Rear-Admiral Du Pont; Tybee Island, December, 1861; commanded forces entering by way of Whale Branch in attack on Port Royal Ferry, January 1, 1862; engaged in the operations against Fernandina through St. Andrew's Sound and in St. John's River.

Promoted to commander, February 21, 1863; commanding monitor "Patapsco," South Atlantic Blockading Squadron, against Fort McAllister, March, 1863, and in the attack on Fort Sumter, April 7, 1863; had charge of a draft of 220 seamen on board of the California passenger steamer "Ocean Queen," May, 1864, bound to Aspinwall; two days after leaving New York suppressed an open and organized mutiny, with the assistance of Boatswain Thomas G. Bell, who was the only aid assigned, receiving in doing so the excellent co-operation of Captain Tinklepaugh,—who commanded the "Ocean Queen,"—his officers, and several of the passengers; commanding steam-sloop "Mohican," North Atlantic Blockading Squadron, 1864–65; in the bombardment of Fort Fisher, December, 1864, and again when it was carried by assault by the army, January, 1865; commanding ironclad "Miantonomah," special service, 1866.

Commissioned as captain, July 25, 1866; special duty, Hartford, Conn., 1866–67; commanding flag-ship "Piscataqua," Asiatic Squadron, 1867–68; Chief of Bureau of Yards and Docks, 1869–71.

Commissioned as commodore, 1872. Chief of Bureau of Navigation, 1871–78. Commissioned as rear-admiral, 1877; retired at his own request, 1878. July, 1878, appointed chairman of a board for the re-location of the Naval Observatory. April, 1879, ordered to attend the convocation at Paris, France, known as the Interoceanic Ship-Canal Congress. Had constructed on his design a cask "balsa," or life-boat, which is now at the navy-yard, Portsmouth, N. H., at which place are built life-boats on this design for all of our vessels of war. Total sea-service 21 years and 1 month; other duty, 17 years and 3 months.

Ammunition. In early times this word signified every description of warlike stores and provisions for attack or defense.

In modern usage its signification is limited to articles in use for charging fire-arms and ordnance of all kinds.

FIXED AMMUNITION. For guns of small calibre the charge and projectile are united for convenient transportation and rapidity in loading.

AMMUNITION BOXES. The boxes carried on the carriage of howitzers.

AMMUNITION CHESTS. Chests stowed in the tops for the convenience of the riflemen stationed there in action.

AMMUNITION-WIFE. A woman of doubtful character.

Amnesty. An act of oblivion or general pardon for all acts committed in time of war, or the proclamation of such pardon.

Amok. Slaughter. The practice, of Malays under the influence of *bang*, of running about the streets, attacking anybody and everybody.

TO RUN A-MUCK. To make an indiscriminate assault.

Amorce. (*Fr.*) Priming powder.

Amoy. A seaport town of China, on an island of the same name. Lat. 24° 10′ 3″ N.; lon. 118° 13′ 5″ E.; nearly opposite to the centre of the island of Formosa. The population, mostly employed in the coasting trade, is about 300,000.

Amperes. An ancient vessel in which the rowers pulled two oars each.

Amphibia. A class of animals which can live either in the water or on the land.

Amphiproræ. Ancient vessels, both ends of which were prow-shaped, so that in narrow channels they need not turn; the prototypes of the double-enders.

Amphiscii. The inhabitants of the torrid zone are thus denominated from their shadow being turned one part of the year to the north and the other to the south.

Amplitude. The angular distance of a heavenly body in the horizon from the east or west point. The *magnetic* amplitude is the angular distance of the body from the east or west point as indicated by the compass. The difference between the *true* and the *magnetic* amplitude is the variation of the compass.

At a given latitude the amplitude depends on the declination of the object. Amplitude is sometimes used to denote the horizontal distance to which a projectile is expelled from a gun, or what is more frequently called the *range*.

AMPLITUDE, OBSERVATION OF. The usual instructions for taking amplitudes are laid down with the view that the body shall be observed at the moment when its centre is really in the rational horizon. Thus the bearing of the sun is directed to be taken when its lower limb appears half-way between the horizon and its centre; the bearing of a star is to be taken at an altitude of 34′: the amplitude of the moon cannot be thus directly observed with accuracy, especially in high latitudes, by reason of her great depression by parallax, but may be found approximately by observing her bearing when her upper limb is in the horizon. In all cases, however, the better plan is to obtain by observation the bearing when the centre of the body appears on the horizon, and apply the necessary corrections (for dip, refraction, and parallax) taken from a table. For the sun, when rising, observe the bearing of the upper limb as it appears on the horizon, and continue to take the bearings of the centre, bi-

secting the sun's disk by keeping the upright wire on the upper limb until the lower limb appears. Read off each bearing. At sunset, when the lower limb touches the horizon, proceed in like manner until the upper limb disappears. The mean of the readings, reckoning from the east or west point, is the observed amplitude. When practicable, the moon may be observed in the same way. In the case of the sun and stars, a table (with latitude and declination for arguments) gives the necessary correction for refraction, to which the requisite dip is added. The same table applied in the *contrary* way gives the correction for the moon, which is the excess of the effect of parallax over the combined effects of refraction and dip. The amplitude of a star should be observed at *setting*, to admit of the body being easily identified.

Ampotis. The running out of the sea.

Amsterdam. An important commercial city, one of the capitals of the Netherlands, at the former confluence of the Amstel with the Y, a lake-like river, now mostly drained, but a small part remains and serves as a port for the city. It has a new artificial harbor on the North Sea, with which it is connected by a ship canal 15 miles long. Pop. 300,000.

Amulet. A charm worn by superstitious people as a preservative against disease or disaster.

Amusette. A shoulder-gun fitted with a swivel, carrying a ball weighing from half a pound to two pounds.

Anabus. A bony fish that has the power of living long out of water and moving considerable distances on land.

Anadromous. A term applied to migratory fishes.

Analemma. An orthographic projection of the sphere on the plane of the meridian. An instrument of brass or wood on which this projection is made. An old form of sun-dial.

Anan. An old word for "What did you say?" Also a corruption of *anon.*

Anas. A genus of water-birds of the order *Natatores*, now restricted to the typical ducks.

Anaumachion. Among the ancients the crime of refusing to serve in the fleet, the punishment for which was infamy.

Anchiromachus. A boat of the middle ages for transporting anchors and naval stores.

Anchor. A heavy iron instrument for retaining a ship in her place. It is attached to the ship by a rope or chain, and is thrown overboard from the bows.

The earlier anchors were made of wood with an arm, and later two arms. Stones were attached to give weight to sink and greater holding power. With all the improvements of modern times, the anchors now in use have undergone but little change of form.

After the wooden anchor followed the iron anchor with a wooden stock. At the present day all navy anchors are fitted with iron stocks.

Anchors are *solid* when the shank and arms are welded together. In most *patent* anchors the arms are movable and capable of being separated from the shank.

The *solid* or common anchor consists of the *shank*, the *ring* (*shackle*, or *Jew's-harp*), the *arms*, and the *stock.*

The *shank* is the main body of the anchor. The *ring* is bolted to the upper end and the *arms* are welded to the other. The *crown* is the heavy end of the shank to which the arms are welded. It is the part which first strikes the ground when the anchor is let go perpendicularly.

The *stock* is the iron beam at right angles to the shank. It has a shoulder near its middle part, and when this shoulder is snug up against the shank it is keyed on the other side. The end opposite to the shoulder is bent for convenience in stowage.

On the ends of the stock are cast-iron balls, the one on the bent end being movable and the other riveted.

The *arm* consists of the *palm* (or *fluke*), the *bill* (*point*, or *pee*), and the *blade.* The *palm* is shaped much like a shield, and is welded and riveted to the *blade.* The *bill* is the part of the arm which projects beyond the palm. The *ring* is that part of the anchor to which the cable is bent.

The essential properties of an anchor are *strength*, *holding*, *quick-holding*, *canting*, *facility of sweeping*, *of stowing*, *and of transport in boats*, *exemption from fouling*, and *quick-tripping.* Of these the most important are *strength*, *holding*, and *quick-holding.*

These qualities depend upon the weight of metal, size and shape of the cross-section of arms and shank, length of arms, shank, and stock, angle at which the arms are set on, size and shape of palm, finish of the bill, curvature of the arm, quality of the material, and the workmanship.

The development of one of these qualities to an extreme degree may involve the sacrifice of another. For instance, the Trotman anchor is notably *exempt from fouling*, as the upper fluke lies down against the shank, but this peculiarity renders it almost impossible to pick it up by *sweeping* for it. An anchor that *holds* well does not *trip* quickly. The holding power of an anchor depends a great deal on the length of the arm; but a long arm is an element of weakness. So there is much to be considered in the form and dimensions of anchors, and it has required a great many experiments to determine them. The American Anchor, designed by Mr. James Brown, master-smith at the Washington Navy-Yard, fulfills all required conditions.

Anchors for the navy are forged under the steam-hammer from scrap-iron, and are gotten out in five parts, viz.: the shank, two arms, stock, and shackle (or ring).

The scrap-iron is first hammered into blooms, the most convenient size being 36 inches long, 10 inches wide, and 4 inches thick. The blooms being in readiness, the parts of the anchor are forged and put together in the following order:

The *shank.* The blooms are piled on the end of a porter bar, heated and welded under a steam-hammer until the mass of iron on the end of the bar is of sufficient size to make the shank. The building-up process begins at the crown, and the mass is gradually drawn out towards the ring end, and swaged smooth under the hammer. The holes are punched for the ring and stock, and the shank is then cut off from the bar.

The two arms are forged separately, also the two palms. The palms are welded on to the arms and riveted, and the bill is drawn out and finished up. The shank is then heated at the crown end, scarfed on one side, and the arm welded

on; then scarfed on the other side and the second arm welded on. The arms are welded on straight, and afterwards heated and bent to the proper angle.

The *stock* is forged from blooms in the same manner as the shank. The ring is forged straight, and afterwards heated and bent to the proper shape and a bolt fitted to the eyes.

The process of annealing anchors has now generally gone out of use.

The following are the proportions of a 6000-pound anchor:

Shank.—Length, 13 feet 8 inches; cross-section at the largest part where the arms are welded on, 10½ by 8½ inches; cross-section at the stock, 8½ by 7 inches, the greatest dimension being in the plane of the arms.

Stock.—The length is equal to the length of the shank over all, and in diameter it is about two-thirds the smallest width of the shank measured in the plane of the arms.

The length of the arm is nearly one-third the length of the shank, and in bending them an equilateral triangle is formed with the length of the arm for one side, the same distance laid off on the shank from the crotch for the second side, and the distance from the end of this line to the bill completes the triangle.

In forging anchors a great deal is done by eye for shape and proportions. The crown and throat are rounded off, and the shank has eight faces, with a straight taper from the crotch to the stock. The weight of an anchor is inclusive of the ring and exclusive of the stock, which is about one-fourth the weight of the anchor.—*C. T. Hutchins*, *Lieutenant U.S.N.*

PATENT ANCHORS. Many designs have been submitted, the most prominent of which are mentioned below. The oxidation of the movable parts of portable anchors is the great source of failure, as they require constant care and attention to keep them in working order.

Isaac's Anchor has a bar of iron from each end of the stock to the middle of the shank, and the palms are connected by a flat elliptical bar of iron. It has great strength, and is notably exempt from fouling, but is deficient in other respects.

Latham's Anchor has an arm provided with three flukes, and the shank is made of two pieces, which separate at the crown end to allow the midship fluke to pass. When the three flukes enter the ground, the flange on the crown-piece takes on the shank and the arms are held rigid. No stock is required.

Marshall's Anchor. The arms are straight and move independently on a pivot, which passes through the crown. The arms are fitted with projections, which assist the flukes to enter the ground.

Martin's Anchor is supplied to the turret-ships of the British navy. The anchor is very compact, and for that reason is especially recommended to rams and turret-ships, as it does not impede the fire nor project from the bows.

Morgan's Anchor has a curved bar of iron, which passes through a slot in the shank and connects the two arms to each other. The arms are separately pivoted to the shank. When one fluke enters the ground the other is drawn down against the shank, the connecting bar serving to strengthen the arms.

Porter's Anchor is the same in principle as Trotman's, which see.

Rodger's Anchor has a shank with a wooden core, the object being to give greater strength with a given weight of metal. He also designed the *pick-ax* anchor, an anchor without palms.

Trotman's Anchor. The oscillatory system is the principal feature of this anchor. The arms are in one piece and work in a slot in the shank. When one fluke enters the ground the other is drawn down against the shank. The backs of the arms are fitted with horns to assist the flukes to enter the ground. It is one of the best of the patent anchors.

The BOWER-ANCHORS are so named from their being carried on the bows. In early days they were of different sizes; the larger one, called the *best* bower, was carried on the starboard bow, the other was known as the *small* bower. These designations are yet retained, though the anchors are now of equal size.

The WAIST- or SHEET-ANCHORS are equal in weight to the bower-anchors, and are carried on the side, abaft the fore-rigging. They are secured with the stock perpendicular, and the shank resting on two shores.

The SPARE-ANCHOR, when no sheets are carried, is of the same size as a bower-anchor, and is stowed inboard.

The STREAM-ANCHOR is one-fourth the weight of the bower-anchor, and is carried inboard.

KEDGES are small anchors, from one-sixth to one-fourteenth the weight of the bower. They are stowed in the chains.

BOAT-ANCHORS are small anchors supplied for the use of the boats. They are stowed in the hold of the ship until needed for service.

With reference to their position anchors are termed *flood*, *ebb*, *weather*, *lee*, *sea*, or *shore anchors*.

TO SHOE AN ANCHOR. To fit triangular pieces of wood to the palms to give greater holding power.

TO COCKBILL THE ANCHOR. To ease off the shank-painter, and hang the anchor by the ring-stopper.

TO LET GO THE ANCHOR. To release it from the cat-head that it may fall to the bottom and hold the ship.

TO DRAG THE ANCHOR. To trail it over the bottom by force of the wind or current.

TO BACK THE ANCHOR. To increase the holding power of an anchor by planting a smaller one ahead of it, and connecting the two with a chain. The holding power of an anchor may be increased by attaching a weight to the bight of the chain, thus bringing the strain lower down, and causing the fluke to *bite* harder.

TO TRIP THE ANCHOR. To heave it clear of the bottom.

TO SIGHT THE ANCHOR. To heave it up to the surface of the water.

TO WEIGH AN ANCHOR. To heave it up to the bows.

TO CAT THE ANCHOR. To hoist it up to the cat-head and pass the ring-stopper.

TO FISH THE ANCHOR. To hoist the flukes up to the bill-board and pass the shank-painter.

TO STOW AN ANCHOR. To secure it in its proper place.

TO TRANSPORT AN ANCHOR. To shift it from one position to another in the ship.

To Secure the Anchor for Sea. To ring it up close to the cat-head, and get the inner fluke inboard, and pass extra lashings.

To Get the Anchor Off the Bows. To take off the extra lashings, and heave the inner fluke up and outboard, so it will slip off the bill-board when the shank-painter is let go.

To Sweep, Drag, or Creep for an Anchor. To endeavor to pick up an anchor or the chain by trailing for it with a grapnel or the bight of a rope.

Foul-anchor. The condition of an anchor when the chain has taken a turn around the flukes, shank, or stock, or when the anchor has caught into some other anchor, chain, or wreck.

The anchor is *aweigh* or *atrip* the moment it is disengaged from the ground. It is *apeak* when the chain is up-and-down. It *comes home* when it is trailed over the bottom as the ship drifts.

Anchor, Drag-, or Floating-. See Sea-anchor.

Anchor, Jury. A temporary anchor constructed to supply the place of one which has been lost. Ships are sometimes obliged to resort to their guns, boilers, and other heavy articles.

Anchor, Mushroom. Has a head shaped like a bowl, and no stock is required. It is used for moorings.

Anchor, Screw. Large screws with broad flanges, used for moorings and to shoe piles.

Anchor, Sea. A species of raft or drag formed of spars and canvas to keep a ship's head to the wind and to decrease her drift. It is attached to the ship by a hawser, and is generally fitted with a buoy and an anchor.

Anchorage. A duty levied upon vessels upon coming to a port for the use of its advantages. The set of anchors belonging to a ship. A place suitable for anchoring. It is marked on charts by an anchor, and is described according to its attributes as good, snug, open, or exposed.

Anchor-ball. A pyrotechnical combustible attached to a grapnel.

Anchor-bar. A large handspike to pry the anchor off the bill-board.

Anchor-chock. Pieces let into an anchor-stock. Pieces of wood or iron upon which an anchor rests when it is stowed.

Anchor-hold. The fastness of the flukes in the ground.

Anchor-hoops. Heavy iron hoops binding a wooden stock to the shank and over the nuts of the anchor.

Anchor-ice. The ice which forms on and incrustates the beds of lakes and rivers.

Anchoring. (*p. pr. of v. t.* to anchor.) (Lat. *ancora*, anchor.) The manœuvre by which a vessel is brought to anchor, *i.e.* brought to a state of temporary rest and security by means of an anchor let go from the vessel.

The anchor, attaching itself to the bottom, is enabled by means of the intervening cable to hold the vessel in place. A vessel may be brought to anchor under a great variety of conditions of wind, tide, and sea.

The peculiar nature of the anchorage itself, and the number of vessels occupying it, must also be considered. For the minor details of all that precede, accompany, and follow this manœuvre, the reader is referred to works on *Seamanship*. The principal points to be observed are, *First*, that on approaching the anchorage both bower anchors (see Anchor) and their cables should be in readiness for use, always having the second anchor ready to let go in case the first, from any cause, should fail. *Second*, that the vessel should be head to tide, or nearly so, when the anchor is let go. *Third*, on approaching the anchorage, under favorable circumstances, the speed of the vessel should be gradually reduced, then stopped, and finally a stern-board be given her, either by the action of the wind or tide, or by the use of sails or engine. The moment of starting astern is that for letting go the anchor. *Fourth*, that the vessel should have sufficient stern-board to lay her cable out clear and straight from the anchor. *Fifth*, that the stern-board should not be so great as to endanger running out too much cable, or of parting in attempting to check it. *Sixth*, that when the cable is finally secured there should be a good scope out. *Seventh*, that when anchored the vessel should be in a good berth.

It is generally conceded that a vessel should never ride to a shorter scope of cable than six times the depth of water. That is to say, if anchored in ten fathoms of water she should not have out less than sixty fathoms of cable for ordinary security. In general, there are three different classes of vessels that may be treated of under this head: the square-rigged sailing-vessel, the *fore-and-after*, and the steamer. To bring one of the former into a crowded harbor, to pick out a good berth and come to anchor in a proper manner, calls forth all the skill and judgment of a practical seaman, and an amount of knowledge which can be obtained only by long and varied experience.

With a schooner we have, ordinarily, only to haul down the head-sails, luff up into the wind, and when the headway is lost and she begins to go astern, to drop the anchor, and then to pay out the necessary scope as she takes it. Or beating in with a strong windward tide (see Tides), we should reverse the operation; lower the fore and mainsails, wear around under the jib, and, when head to tide, let go the anchor.

With a steamer the operation is still more simple. Steering directly for her berth, the engines are first "slowed," then stopped, and finally backed, if necessary; when the headway ceases the anchor is let go and the cable paid out as she takes it. If she had been steaming in against the tide she will, on stopping the engines, soon go astern and take her cable. If she has the tide with her, as soon as the anchor touches the bottom she will begin to swing to the tide. When head-to, pay out to the necessary scope.

Anchoring by the Stern is to have the cable brought in through a stern-chock, so that when the anchor is let go from the bow the vessel will ride by the stern.

Anchoring with a Spring: to attach a hawser to the ring of the anchor before letting go, so that when the anchor is down and an equal strain brought upon the cable and the hawser, the vessel will ride to a bridle, presenting her broadside to the wind or tide as either may prevail. The vessel's head may be then made to change direction by shortening in, or veering on the cable or hawser, as desired.

The two last manœuvres are practiced in war: the former when it is undesirable to swing around, as when anchoring in the ordinary way; the latter when it is desired to change the ship's

head in certain directions so as to bring the batteries to bear on the enemy.

Anchoring in very deep water (as a temporary expedient) may be done by means of the stream-anchor (see ANCHOR) and a hawser.—*S. B. Luce, Captain U.S.N.*

Anchor-lining. Short pieces of plank fastened to the ship's side, under the fore-channels, to prevent the anchor from bruising the side

Anchor-ring. The ring to which the cable is bent. Now generally a shackle, or Jew's-harp.

Anchor-seat. An old term for the prow.

Anchor-shackle. The shackle in the end of the shank. The ring.

Anchorsmith. A forger of anchors.

Anchor-stock. A beam of wood or iron, secured to the shank at right angles to the flukes.

Anchor-stock-fashion. The method of placing the butt of one plank nearly over the middle of another; the planks being broadest in the middle and tapering to the ends resemble an anchor-stock.

Anchor-stocking. A method of securing and working planks with tapered butts.

Anchor-watch. A small number of men kept on duty at night, while the ship is in port, to be in readiness to do any duty that may be required, especially to let go an anchor, veer cable, hoist head-sails, set spanker, or to man a boat.

Anchovy. A fish of the family *Clupiedæ*, caught in large numbers in the Mediterranean, and pickled for exportation.

Ancon. The angle of a knee-timber.

ANCON. (*Sp.*) Harbor, bay, anchorage.

Anderson, Culjohn. A Swede. He made two journeys into the interior of Africa in exploration of the source of the Niger. He reached Lake Ngami, in the S.W. of the continent, and published a work on the Okevengo River.

Andromeda. A northern constellation behind Pegasus, Cassiopeia, and Perseus, representing the figure of a woman chained. *a Andromedæ*, Alpheratz.

Anemometer. An instrument for measuring the force and velocity of the wind. They are of various forms, and indicate the force directly, as against a plate compressing a spring, or the velocity, as by a revolution of a wheel carrying vanes or hemispherical cups. They are often self-registering.

Anemoscope. A vane-index with pointers to show the change of the wind without referring to the vane.

An-end. The position of a spar when erected perpendicularly. The topmasts are *an-end* when they are fidded.

To STRIKE A PLANK AN-END is to drive it in the direction of its length.

Anent, or Anenst. Opposite to; over against.

Aneroid Barometer. See BAROMETER.

Angel-fish. The *Squatina angelus*, of the shark family. It is six or eight feet long, with a rough back and smooth white belly.

Angel-head. The barb of an arrow; probably *angle-head.*

Angel-shot. A projectile composed of two hollow half balls connected by a chain, which is inclosed in their cavity when they are brought together; a kind of chain-shot.

Angil. An old term for a fishing-hook, and also for the red worm used for bait.

Angle. A corner. The difference in direction of two lines in the same plane, proceeding from the same point.

A SPHERICAL ANGLE is formed by the intersection of two great circles. It is the inclination of the planes of these circles to each other.

A SOLID ANGLE is formed by the meeting of three planes at one point. See ELEVATION, FIRE, SIGHT, MAST-HEAD, LEEWAY.

Angon. A half-pike or javelin.

Angosiade. An astronomical falsehood; a term originating from the pretended observations of D'Angos at Malta.

Angra. (*Sp.*) Bay or inlet.

Anguilliform. Having the appearance of eels.

Angular Crab. An ugly long-armed crustacean, with eyes on remarkably long stalks.

Anilla. A commercial term for indigo.

Animal Flowers. Actiniæ, or sea-anemones and similar animals project a circle of tentacula resembling flowers. They were formerly all classed under *Zoöphytes.*

Animate. To give power or encouragement.

To ANIMATE A NEEDLE. To magnetize it.

To ANIMATE A BATTERY. To put the guns in position.

Anker. A Dutch measure containing ten wine gallons.

ANKER-FISH. A kind of cuttle-fish.

Ankle-bone. A sailor's name for the crawfish.

Anna. In the East Indies, the 16th part of a rupee, about three cents in United States currency.

Annapolis. A city and port of entry in Maryland, on the S.W. bank of the Severn River, 3 miles from its entrance into the Chesapeake Bay, 30 S. by E. from Baltimore. Lat. 38° 58′ 50″ N.; lon. 76° 30′ W. The United States Naval Academy is here located. Pop. about 6000.

Annealing. There are many substances which, when rapidly cooled after having been heated, become exceedingly brittle; this result may be prevented by very slow cooling, which process is termed *annealing*. By this process the substance is rendered softer and less brittle, but its elasticity is impaired.

Annet. A kind of gull.

Annex. A term used on the Mississippi and other Western rivers to indicate the pilot-house of steamboats, called also "Texas." The term is said to have originated about the time of the annexation of Texas to the United States.

Annihilator, Fire. See FIRE-EXTINGUISHER.

Anniversary Winds. Those which blow constantly at a certain season of the year; as, monsoon and etesian winds.

Annotinæ. The ancient Roman provision vessels.

Annual. Yearly.

ANNUAL ACCOUNTS. The ship's books and papers for the year.

ANNUAL VARIATION. The yearly change in the variation of the compass. The change produced in the right ascension or declination of a star by the precession of the equinoxes and the proper motion of the star taken together.

Annul. To revoke; to rescind.

Annular. Resembling a ring.

AN ANNULAR ECLIPSE takes place when the apparent diameter of the moon is less than that of

the sun, and a ring of light surrounds the moon while central.

Annular Scupper. A scupper in which the hole may be enlarged or diminished by a movable concentric ring.

Annulling Signal. A signal which denotes that the previous signal is void.

Annulus Astronomicus. A ring of brass used formerly in navigation.

Anode. The positive pole of an electric battery; or, more strictly, the *path* by which the current passes out and enters the electrolyte on its way to the other pole; opposed to *cathode.*

Anomalistic Revolution or Period. The period during which a planet makes a complete revolution from any point in its orbit back again.

Anomalistic Year, or Periodical Year. The time in which the earth makes its anomalistic revolution, which is longer than the tropical year on account of the precession of the equinoxes.

Anomaly. Deviation from established rules.

Anomoural. Irregular in the character of the tail or abdomen; as, the *anomoural crustaceans,* a group between the crabs and the shrimps.

Anon. Quickly; immediately. At another time.

Anonymous Partnerships. Those not carried on under a special name, and the particulars of which are known only to the parties themselves.

Ansæ. The handles of old ordnance. The projections of Saturn's rings in certain situations.

Anser. A Linnæan order of natatorial birds swimming by means of web-feet, as the duck, or of lobe-feet, as the grebe.

Anson, George, Lord. An English admiral; born in Staffordshire, England, in 1697; entered the navy at an early age, and in 1724 was made post-captain. He was soon ordered to the Carolina station, where he purchased land and built a town called after his own name. He was subsequently appointed to the command of the South Sea Expedition which sailed from England in 1740. After his return, in 1744, he was successively created rear-admiral of the blue, commissioner of the admiralty, and vice-admiral. In 1747 he commanded the Channel Fleet, and captured six French ships of war. As a reward for this brilliant exploit he was created a peer, with the title of Lord Anson, Baron of Soberton. He was First Commissioner of the Admiralty from 1751 to 1756. In 1757 Anson was made admiral, and in the same year was placed at the head of the admiralty. Died in 1762. No book in the English language possesses a greater charm for youth and the lover of adventure than "Anson's Voyage."

Answer. To reply. To suit; as, this boat will not *answer.*

Answer the Helm. A ship is said to answer the helm when she obeys it readily.

Answering Pennant. A pennant which is hoisted to indicate that a signal has been read and understood.

Antarctic. Relating to the South Pole or to the region near it.

Antarctic Circle. A parallel 23° 28′ from the South Pole.

Antarctic Pole. The South Pole.

Antarctic Ocean. The portion of the ocean included within the Antarctic Circle.

Antares. A star of the first magnitude, popularly known as the *Scorpion's heart* (*a Scorpionis*).

Antecians. Those inhabitants of the earth who live on the same meridian, but in opposite hemispheres.

Antelucan. Before daybreak.

Ante-meridian. Before noon.

Anthelion. A luminous appearance on a cloud, over against or opposite to the sun. It consists of a circular ring or rings around the shadow of the spectator's own head as projected on a cloud or on some opposite fog-bank.

Anthracite. See Coal.

Anticthones. Inhabitants of countries diametrically opposite to each other.

Anti-friction Composition. See Friction.

Anti-friction Metals. See Friction.

Anti-gallicians. Extra backstays sometimes used by merchant vessels running before the trades.

Anti-guggler. A straw or tube introduced into a bottle or cask to suck out the contents.

Anti-parallels. Lines which make equal angles with two other lines but contrary ways.

Antipathes. A kind of coral having a black, horny stem.

Antipodes. The inhabitants of the earth diametrically opposite to each other. The term is now applied to the countries which are at the opposite ends of any diameter of the earth.

Antiscii. The people who dwell in opposite hemispheres, and whose shadows at noon fall in contrary directions.

Antiscorbutic. Opposed to, or counteracting scurvy. See Scurvy.

Antiseptic. Opposed to, or counteracting putrefaction, or tendency to putrefaction, in the system.

Antlia. A constellation known as the *Air-Pump.*

Antwerp. A city of Belgium, on the right bank of the Scheldt. Lat. 51° 13′ 2′ N.; lon. 4° 24′ 2″ E. It is strongly fortified, the walls and other defenses completely incompassing the city on the land-side, having more than 12 miles of solid ramparts. Of the stocks, dock-yard, and basins, constructed by Napoleon at an expense of $10,000,000, the last only remain. The harbor is one of the finest in the world; it admits vessels of any size, and can easily hold 1000. Pop. 150,000.

Anvil. The massive block of iron on which shipsmiths hammer forge-work. A streamer at the end of a lance.

Any Port in a Storm. A phrase signifying contentment with one's lot. The best practicable way out of a difficulty.

Ape, or Sea-Ape. The long-tailed shark. An active American seal.

Apeak. Near the perpendicular. An anchor is *apeak* when the chain is up-and-down. The oars are *apeak* when the blades are thrown forward and the crew is waiting for the order to "give way" in racing. With an awning spread in a boat it is impossible to "up oars." When they are raised as high as the awning permits they are said to be *apeak.*

Apertæ. Ancient deep-waisted ships with high-decked forecastle and poop.

Aperture. The clear diameter of the object-glass of optical instruments.

Apex. The summit or vertex.

Aphelion. The point in a planet's orbit which is at the greatest distance from the sun.

Aphellan. Castor. *a Geminorum.*

Aphracti. Ancient vessels with open waists.

Aplanatic. Having two or more lenses of different curvatures so combined that their respective aberrations neutralize each other, and the resulting compound lens is free from spherical aberration.

Aplets. Nets for the herring fishery.

Aplustre. An old word for the ornament at the bow and for the ensign at the stern.

Aplysia. A sea-hare of the genus of mollusks of the order *Tectibranchiata.* Some of the species have the power of throwing out a deep purple liquor, which colors the water for a considerable distance and serves to conceal the animal.

Apobathræ. Ancient gang-boards from the ship to the wharf.

Apogee. That point of the moon's orbit which is at the greatest distance from the earth. Formerly, on the supposition that the earth was the centre of the system, this name was given to the point in the orbit of the sun, or of a planet, which was at the greatest distance from the earth.

A-poise. Balanced; properly trimmed.

Apostle. A knight-head or bollard timber. A paper sent up on appeals in the admiralty courts.

Apothecary. The chief assistant of the medical officer. He is appointed by the surgeon for the cruise. Familiarly known as "Pills."

Appalachicola. A port of entry of Florida, on the Gulf of Mexico, at the mouth of the Appalachicola River. Pop. 1200.

Apparatus. Ammunition and equipage for war.

Apparel. In marine insurance, the furniture of a ship; as, masts, sails, ground-tackle, guns, etc. It is a more comprehensive term than *apparatus.*

Appareled. Fully equipped.

Apparent. (Lat. *apparere*, to appear.) An adjective indicating that which appears to the senses—phenomenal.

"*Apparent*" is sometimes equivalent to *true* or *real*, when contrasted with *fictitious* or *imaginary.* Thus the "apparent sun" is the *true* sun we see, as opposed to the *imaginary* "mean sun"; "apparent time" is reckoned by the hour-angles of the same sensible body opposed to "mean time," which is defined by the movement of the fictitious mean sun; "apparent noon" is when the true sun is on the meridian, and is distinguished from the "mean noon," which is marked by the transit of the mean sun.

"*Apparent*" is sometimes used as a qualification, distinguishing on the one hand from *observed*, and on the other from *true.* It is in this sense applied to elements corrected for instrumental and circumstantial sources of error, but not yet reduced to the common standard for comparison and computation. We thus have the "apparent altitude" of a heavenly body, and the "apparent distance" of two heavenly bodies, distinguished on the one hand from the "observed," and on the other from the "true" altitude and distance. So also there is the "apparent place" of a heavenly body in the celestial concave, and the "true place."

"*Apparent*" is sometimes opposed to *proper*, to distinguish the phenomenal diurnal motion of the heavenly bodies resulting from the earth's rotation on her axis, from that which is due to the annual revolution of the earth in her orbit, and to the motion of each body in its orbit.

Apparition. The first appearance of a star after occultation.

CIRCLE OF PERPETUAL APPARITION. A circle whose distance from the elevated pole is equal to the latitude of the place of observation. Within this circle the stars never set.

Appearance. The first making of a land-fall; formerly astronomically used for *phenomenon* and *phase.*

Appendages. The valves, gauges, etc., of a boiler. The comparatively small portions outside the main body of the ship; as the keel, rudder, etc. Their volume is computed separately and added to the main calculation to determine the displacement of a ship.

Apple-pie-order. In excellent condition; neat and trim.

Appoint. To assign or designate by authority.

APPOINTED OFFICERS are petty officers shipped for the cruise for special service, and not entitled to continuous-service certificates; as, master-at-arms, yeomen, etc.

An *acting appointment* may be issued by the commander-in-chief when a permanent vacancy occurs which cannot be filled from the supernumerary officers of other ships. This appointment must be in writing, and subject to revocation by himself, his successor, and the Secretary of the Navy. An officer holding an *acting appointment* wears the uniform of the grade to which he is appointed, and annexes his acting rank to his official signature.

Appointments. The various details constituting the equipment of a vessel, or the accoutrements of an officer or enlisted man.

Apportionment. The act of apportioning; a dividing into just proportions or shares; as, in the distribution of prize-money.

Appraisement. A valuation. A law instrument taken out by the captors of a vessel.

Apprehend. To seize a person with a view to punishment.

Apprentice. See NAVAL APPRENTICE.

Appropriation. A sum of money set apart by Congress for a particular purpose.

Approve. To sanction officially.

Appulse. The near approach of one heavenly body to another, so as to form an apparent contact.

Apron. A timber conforming to the shape of the stem, and fixed in the concave part of it, extending from the head to some distance below the scarf, joining the upper and lower stem-pieces.

APRON OF A DOCK. The platform on which the sill is fastened down.

APRON OF A GUN. The metal cover for the lock and vent.

Apsides, Line of. The right line joining the aphelion and perihelion points of the orbit of a planet. The term is also applied to the line joining the perigee and apogee of the moon.

Apsis. Each extremity of the line of apsides.

Apus. A constellation known as the *Bird of Paradise.*

Aquarius. The Water-carrier, the eleventh sign in the zodiac, which the sun enters about

the 21st of January; so called from the rains which prevail at that season in Italy and the East.

Aquatic. Inhabiting or relating to the water.

Aquatites. The law-term for everything living in the water.

Aque. Wall-sided, flat-floored boats, which navigate the Rhine.

Aqueduct. A conduit or canal built for the conveyance of water.

Aquila. The Eagle; a constellation in which is a very bright star (*Altair*) much used by navigators in taking observations.

Aquilon. The northeast wind.

Ara. The Altar; a southern constellation, containing nine stars.

Aramech. The Arabic name for the star Arcturus.

Arbalist. An engine to throw stones, or the cross-bow used for darts and arrows. Formerly *arbalisters* formed part of the naval force.

Arbiter. The judge to whom a matter is referred for adjustment.

Arbitrage. The referring of commercial disputes to two or more disinterested persons.

Arbitration. The settlement of disputes out of court.

Arbor. A spindle or axis.

Arby. The thrift, or sea-lavender.

Arc. A part of a circle.

Diurnal Arc. That part of a circle, parallel to the equator, which a heavenly body describes from its rising to its setting. *The nocturnal arc* is the arc described by the body from its setting to its rising.

The Arc of Direction or Progression is the arc which a planet appears to describe when its motion is direct in the order of the signs.

Arc of Vision. The sun's depth below the horizon when the stars begin to appear.

Archangel. A town of Russia, on the Dwina, 20 miles from its embouchure in the Bay of Archangel. Lat. 64° 32′ N.; lon. 40° 33′ E. This is one of the oldest ports in Russia, having been founded in 1584, and was long the only one. Pop. 20,000.

Arch-board. The part of the stern over the counter, immediately under the knuckle of the stern-timbers.

Arched Squall. See Squall.

Archel, Archil, or Orchil. A lichen found on the rocks of the Canary and Cape de Verde Islands. Litmus is obtained from it.

Arches. A term among seamen for the Archipelago. See Galley-arches.

Archi-gubernus. The commander of the imperial ship in olden times.

Archimedes' Screw. An ingenious spiral pump invented by Archimedes B.C. 260. It is also used for removing grain from a lower to a higher level. The name is applied also to the screw-propeller.

Arching. The drooping of the extremities of a vessel. See Hogging.

Archipelago. Originally the Ægean Sea. A body of water interspersed with many islands.

Architecture. See Naval Architecture.

Archives. Public records and papers, which are preserved as evidence of facts.

Arch of the Cove. An elliptical moulding sprung over the cove of the ship, at the lower part of the taffrail.

Arctic. Northern, or lying under *Arktos*, the Bear.

Arctic Pole. The north pole of the globe.

Arctic Ocean. The expanse of water within the Arctic Circle.

Arctic Circle. A parallel distant 23° 28′ from the north pole. It divides the north frigid from the north temperate zone.

Arcturus. A star of the first magnitude close to the knee of Boötes. *a Boötis.*

Ardent. Said of a ship when she has a tendency to come to the wind, and keeps a strain on the weather tiller-rope.

Ardent Spirits. Distilled liquors. They are not permitted to be on board a man-of-war except as medicinal stores.

Arenaceous. Brittle; sandy; partaking of the qualities of sand.

Arenal. In meteorology, applied to a cloud of dust so thick as to prevent seeing a stone's-throw off, common in South America, being raised by the wind from adjoining shores.

Arenation. The burying of scorbutic patients up to their neck in sand; spreading hot sand over a diseased person.

Arendal. A seaport town of Norway, 36 miles N.E. of Christiansand, on the Skager-Rack, at the mouth of the Nid-Elv. It has a custom-house and yards for ship-building. Pop. 5800.

Areometer. An instrument for measuring the specific gravity of fluids; a hydrometer.

Argin. An old word for embankment.

Argo. The name of the ship which carried Jason and his companions on their romantic expedition to Colchis in quest of the golden fleece.

Argol. The lees of wine adhering to the cask; supertartrate of potassa.

Argonauta. The paper-nautilus. The sail which it spreads is a modified arm, which invests the outer surface of the shell.

Argonauts. The company that sailed in the "Argo." A geographical society instituted at Venice, to which we are indebted for the charts and maps of Coronelli. In the United States, the men who first emigrated to California on the discovery of gold in 1849 are sometimes styled Argonauts.

Argo Navis. The constellation of the Ship, containing 9 clusters, 3 nebulæ, 540 single and 13 double stars, of which 64 are visible.

Argosy. A ship of great burden, particularly of the Levant.

Argozin, or Argnesys. The person who attended to the shackles of the galley-slaves.

Argument. (Lat. *argumentum*, a reason.) In astronomical tables the argument is that quantity upon which the tabulated one depends, and with which, therefore, the table is "entered." Thus, in a table of correction for refraction, the altitude is the argument. When the element tabulated depends upon two given ones, then there are two arguments with which to enter the table,—one at the side, the other at the top. Thus, for the correction for the moon's altitude, the arguments of the principal table are the apparent altitude and the minutes of the moon's horizontal parallax.

Argus-shell. A species of shell beautifully variegated with spots, resembling in some measure those in a peacock's tail.

Aries, the Constellation of. (Lat. *Aries*, *Arietis*, "The Ram.") The first constellation of the

ancient zodiac, marking the period for the commemoration of the mythical golden fleece. The only two stars in it of any note are α and β near together in the horns, α being the more northerly.

ARIES, THE SIGN OF. The division of the ecliptic, including the first 30° of longitude, reckoning from the first point of Aries. This origin, owing to the precession of the equinoxes, is at present in the constellation Pisces. Symbol γ.

ARIES, FIRST POINT OF. The "*Vernal Equinoctial Point*," one of the points where the ecliptic crosses the equinoctial, so called as being the commencement of the sign Aries. See EQUINOCTIAL POINTS.

Aries. A battering-ram. (*Roman Antiq.*)

Aris. Sharp corners of stones in piers and docks.

Aris-pieces. Those parts of a made mast which are under the hoops.

Ark. Noah's vessel. It was 300 cubits in length, 50 in breadth, and 30 in height, and it was payed over with bitumen. A comparison of its proportions with those of the "Great Eastern" shows a considerable similarity. Reckoning the cubit at 21 inches, the length of the ark would be 525 feet, breadth 87 feet 6 inches, height 52 feet 6 inches, the "Great Eastern" being in length 680 feet, breadth 83, depth 58. It is mentioned by German commentators that Peter Jansen, in 1609, built a vessel of the same proportions as the ark, though smaller, viz.: length 120, width 20, depth 12 feet. It was found most convenient for stowage, containing one-third more freight than ordinary vessels of the same tonnage, though it was unsuited for making way quickly through the water.

ARK. A mare's-tail cloud. A flat-boat.

Arm. A weapon. An inlet of the sea. The end of a yard, beam, bracket, or axle. A branch of the military service. One of the wings of angle-iron. The part of an anchor to which the flukes are attached. An index-hand or pointer.

TO ARMS! A summons to war or battle.

UNDER ARMS. Armed and ready for fighting.

TO BE IN ARMS. To be in a state of hostility.

STAND OF ARMS. A complete set for one soldier, with equipments; frequently the rifle and bayonet alone.

Arm. To fit, furnish, and provide for war. To wind rope-yarns around about a cross bar shot to facilitate ramming it home. To put tallow in the cavity at the bottom of a lead to bring up specimens of the bottom.

ARM AND AWAY! The order for armed boats to prepare for service.

Armada, The Invincible. The famous Spanish armament so called consisted of 150 ships, 2650 great guns, 20,000 soldiers, 8000 sailors, and 2000 volunteers, under the Duke of Medina Sidonia. It arrived in the Channel, July 19, 1588, and was defeated the next day by Drake and Howard. Ten fire-ships having been sent into the enemy's fleet, they cut their cables, put to sea, and endeavored to return to their rendezvous between Calais and Gravelines; the English fell upon them, took many ships, and Admiral Howard maintained a running fight from the 21st of July to the 27th, obliging the shattered fleet to bear away for Scotland and Ireland, where a storm dispersed them, and the remainder of the armament returned by the North Sea to Spain. The Spaniards lost fifteen capital ships in the engagement, and 5000 men; seventeen ships were lost or taken on the coast of Ireland, and upwards of 5000 men were drowned, killed, or taken prisoners. The English lost but one ship.

Armadilla. A squadron of guarda-costas which formerly cruised on the coast of South America to prevent smuggling.

Armador. A Spanish privateer.

Armament. A term expressing collectively all the great guns and small-arms, with their equipments, but generally applied to the great guns only.

Armamenta. The rigging, tackling, and all necessary furniture of an ancient ship.

Armatæ. Ancient ships fitted with sails and oars, but which fought under oars only.

Armature. A piece of soft metal connecting the poles of a magnet. It serves to prevent the dissipation of the magnetic force.

Arm-chest. A portable locker to afford a ready supply of arms and accoutrements.

Armed. Supplied with weapons; fitted and furnished for war.

Armed-in-flute. Partially armed, a part of the battery having been removed and the effective armament thus reduced below that which the vessel rates.

Armed-mast. A mast made of more than one tree.

Armed Neutrality. See NEUTRALITY.

Armed-ship. A vessel fitted out by private parties to cruise against an enemy's commerce. She is furnished with a letter-of-marque.

Armed-stem. A prow strengthened by armor.

Arming. The tallow used to arm the lead.

Armings. Red dress cloths, formerly hung outside the upper-works on holidays. A kind of boarding-netting.

Armipotent. Powerful in war.

Armistice. A cessation of arms for a short time by convention; a truce.

Armlet. A small arm of the sea.

Armogan. An old term for good season or opportunity for navigation, which if neglected rendered valid a claim for demurrage. A Mediterranean term for fine weather.

Armor. The term, as now generally accepted, refers to metallic protection against the fire of artillery, whether applied to ships or forts. The metal of which armor has been heretofore composed was iron; but the development in the power of artillery has rendered it necessary to seek other metals which would be able to offer a more effective resistance to the impact of heavy shot with high velocities. Steel has been much experimented with, and has been partially adopted, and later experiments lead to the supposition that a combination of iron and steel, called "compound armor," will ultimately be in general use. A description of this combination of metals will be found under its proper heading. The thickness of armor must of course depend upon the service on which a ship is to be employed and upon her floating capacity; and, in case of forts, upon the depth of water in the approaching channels, which will determine the character of vessel that is likely to be able to approach within range; but interesting questions have arisen as to the manner in which armor should be applied, whether it should be left altogether unsupported, or whether partially sup-

ported, or whether assisted by direct support from the structure to which it is attached, or whether elastic or solid backing is the most advantageous. We will review some of these cases which have constituted the points of discussion on armor.

Fig. 1 represents the armor-plate as applied to the "Warrior," the first regular ironclad vessel of modern times. In this case the armor is $4\frac{1}{2}$ inches thick, with a wood backing of 18 inches and a skin-plating of $\frac{5}{8}$ inch. The object of the iron plate is to offer a strong obstacle to the blow of the projectile, expending, unaided, its whole power of resistance in the effort. So much of the energy of the projectile as can be absorbed by the strength of the plate neutralizes that amount of the damage that might have been done to the vessel, and if the plate is destroyed it has done its duty in affording this much protection.

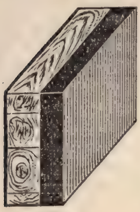

Fig. 1.

The wood backing acts as a cushion to save the hull of the vessel from receiving any damage from the shock of the impact. This is the most simple means of applying armor. It is, in the words of an eminent constructor, "a good thickness of wood with a patch of iron on the outside," which he declared to be "the best armor in the world for ships."

An improvement on this plan of applying armor was suggested by Mr. Chalmers, of England, who, observing the easy manner in which the wood backing yielded to the force of impact, conceived the idea of reinforcing it so as to prevent it from being so readily deranged. His idea was that, as the force of impact was confined to one point, and as the wood backing naturally yielded in all directions to the pressure applied, an increased element of support could be supplied to the wood backing if this tendency could be controlled. Accordingly, he proposed that thin plates of iron should be sandwiched in, horizontally, between the layers of wood backing, so as to control in a measure the yielding of the wood in a vertical direction. These plates of iron were loosely disposed between the layers of wood, being attached neither to the skin-plating nor to the armor. On this principle there was constructed in England a Chalmers target, which was fired at with very good results favoring the idea, but it was never officially adopted by the English government. Fig. 2 represents the "Warrior" armor with the Chalmers plates, as proposed by the inventor.

About the time of the experiments with the Chalmers target, the chief constructor of the English admiralty introduced into the construction of vessels, intended for ironclads, a horizontal iron girder on the outside of the hulls, which was riveted to the side by angle-irons, and which gave much additional rigidity to the hull. Fig. 3 represents the armor of the "Bellerophon," in which the horizontal girder was introduced.

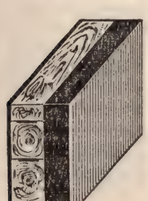

Fig. 2.

In comparing Figs. 2 and 3, it will be seen that the object of the horizontal plate of the Chalmers target is achieved in the backing of the armor of the "Bellerophon," but with a difference. In both instances the horizontal disposition of the iron plate between the layers of the wood backing satisfies the demand made by Mr. Chalmers for the support of the wood backing, but the proposition of Mr. Chalmers went no farther than this. His idea was simply to reinforce the backing so as to enable it to afford a more decided support to the armor; the object was to prevent the derangement of the wood backing, consequent upon impact at one point, by obstructing the vertical yielding of the wood away from the point of pressure. This effort was confined solely to the backing. But, in the "Bellerophon" armor, it will be seen that the horizontal girder, which does the work of the Chalmers plate between the layers of the wood backing, is connected with the hull of the vessel, and forms a part of the structure. This involves another and a very important consideration, for the shock of impact is thus carried to the hull of the vessel, and the consideration of the subject presents a very different aspect. A "thickness of wood with a patch of iron on the outside," bolted to a ship's side, is simply an independent attachment, and if the armor is shattered by the projectile, and the backing is pierced, all the independent work that can be done by this covering has been performed; but if the inner face of the armor rests against the edge of a horizontal iron plate or girder which is connected to the hull, this plate acts as a strut behind a target, and in supporting the armor it receives the force of the blow, which it communicates to the hull. A point made in defense of the use of the girder as a support to the armor is, that the force of the shock is not communicated to one point alone of the frame of the hull, but is disseminated along an extensive portion of the vessel on each side of the point of impact.

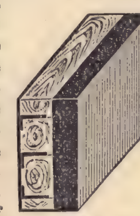

Fig. 3.

Mr. John Hughes, of the late Millwall Iron-Works, on the Thames, England, developed the idea of support to the armor-plate by the introduction of a hollow stringer, which bears his name, which was most successfully applied in the celebrated Millwall shield,—a target which was fired at at Shoeburyness in 1868. The Millwall shield exhibited very superior power of resistance to all other targets that were experimented on at that time. The experiments of that year were made particularly interesting from the fact that a Rodman 15-inch gun was one of those that were used in the firing, and the inferiority of the gun in capacity to penetrate armor was made clearly perceptible. Fig. 4 represents the Hughes hollow girder or stringer, which is placed horizontally and riveted to the side of the vessel.

The hollow portion of the stringer is filled in with oak.

On the closing of the Millwall works, Mr. Hughes undertook the establishment of large iron-works in Russia, under the patronage of the government, and his hollow stringers were adopted by that government and were applied to the turreted vessel called the "Hercules" that was building in St. Petersburg in 1871.

The name of this vessel was afterwards changed to "Peter the Great." The hollow stringers, as applied to this vessel, were estimated to be equal to two inches of iron in increasing her defensive capacity. An objection has been made to the use of the Hughes hollow stringer on the ground that it gave too much solidity to the backing, thereby neutralizing the advantage that was supposed to rest in the elasticity afforded by the wood cushion; but the Russian authorities assert that, under the violence of the impact of a heavy projectile, there is a de-

Fig. 4.

cided amount of elasticity developed in the stringer itself, which is quite sufficient to refute the charge that the whole structure is rendered rigid by the use of this device. In the case of the "Peter the Great," the Hughes stringers were not placed in positive contact with the armor-plate, but were provided with a cushion of lignum-vitæ, about two inches thick, which intervened between the outer face of the stringer and the inner side of the plate; this was considered as a refinement in the details of applying the stringer, which answered all objections to its use.

Fig. 5 represents a method of reinforcing the backing for armor which was adopted for the "Colossus" and her class of monitors for the United States navy, but the idea has not progressed beyond its conception.

At the present time the Chalmers horizontal plate, as applied by the English admiralty, connected by an angle-iron to the hull and encircling the vessel, may be considered as the most generally adopted plan of reinforcing the armor of ironclad ships.

In the case of forts, the general plan is to plate with iron the stone-works already constructed, and, at Spithead, for example, the same plan is carried out with new fortifications; but a notable exception is made to this rule by the Russians in the new works which they have established for the defense of St. Petersburg at Cronstadt. A description of the different systems of armor used in these defenses will be the best citation that can be made of such plans for defense as have been considered worthy of being adopted.

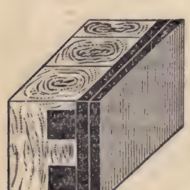

Fig. 5.

On the south side of the channel the defenses consist entirely of turrets, constructed on the English plan of rotation as used in the English turreted ironclads. The outside plating of these turrets is 12 and 14 inches thick, and the hollow stringers of Hughes constitute the backing.

On the northern side of the channel there are erected five casemated batteries, the armor of each differing from that of all the others.

Fig. 6 represents the system adopted for the first one of these batteries. It consists of a 9-inch iron plate, backed by 12 inches of teak, resting against a 1-inch plate of iron, which is sup-

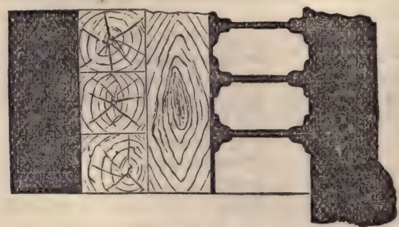

Fig. 6.

ported by horizontal girders of iron, 12 inches wide, riveted to an inner 1-inch skin, all of which is backed by struts, which serve to divide the interior space in the battery allotted to the service of each.

Fig. 7 represents the armor of the second battery, which is constructed on the same plan as that of the first battery, with the exception of the girders and the inner skin, the 1-inch plate behind the wood backing forming the inner skin. In this plan the wood backing is increased to 18 inches thickness.

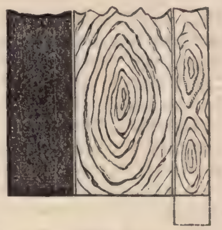

Fig. 7.

Fig. 8 represents the armor of the third battery, which is called the Lancaster armor. The edges of the plates are tongued and grooved, and are built up one upon the other. A part of each plate has a thickness of 14 inches, while the rest of the same plate is 8 inches thick. The inner side of this armor presents a surface of horizontal ribs, the exterior surface is smooth, the inequality of the thickness of each plate being confined to the inner side. The armor is supported behind by iron uprights, having on one surface projecting squares, which enter into the recesses between the ribs of the plates. These uprights are separated by intervals of 2 or 3 feet. The whole is backed by struts.

Fig. 8.

Fig. 9 represents the fourth battery with its armor. This battery is built of granite blocks of Finland stone, 10 feet thick. This is covered by 2 inches of teak, on which is placed the armor, consisting of plates 9 inches in thickness. This construction not requiring the support of struts, the battery is quite open from one end to the other, which gives the beautiful stone an opportunity of showing to advantage.

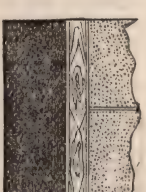

Fig. 9.

Fig. 10 represents the fifth battery, which has 9 inches of armor on the exterior. Behind this there are placed uprights of iron 6 inches square

placed 6 inches apart, the intervals being filled with wood. Behind this is a wood backing consisting of 12 inches of teak. Behind this are placed the hollow stringers of Hughes filled in with wood. These stringers are 10 inches in width, the thickness at the outer rectangular face is 1½ inch, and the spread of the angle-irons forming their base is 12 inches. The stringers are thus 12 inches apart. These are riveted by their angle-iron base to the inner skin of 1-inch iron.

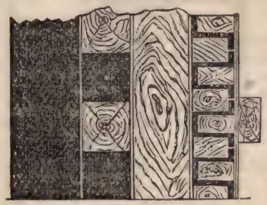

FIG. 10.

In this combination of systems the Russian authorities have adopted each in its completeness. Each invention has been taken as a whole, and the result is a combination of many systems without a complication of different ideas.

Propositions have been made to increase the elasticity of the backing by the introduction of hardened rubber, etc., but these plans have been found rather to assist than to impede the penetration of projectiles.—*E. Simpson, Commodore U.S.N.*

Armor, Compound. Wrought iron and steel have, each, advantages and disadvantages as material for armor for vessels of war. Wrought iron is tenacious, but does not offer sufficient resistance to the *punching* power of the projectile, whereas steel offers great resistance to the punching power, but is comparatively easily crumbled or shattered by a succession of blows.

COMPOUND ARMOR is the result of an effort to combine the good qualities of the two metals by facing the iron armor with steel plates. The steel prevents the penetration of the shot, and the iron backing by its great tenacity prevents the destruction of the steel by shattering.

The plates are welded together in the following manner: The iron plate, raised to a red heat, is placed in a form, and over it is poured molten steel. The temperature of the molten steel being higher than the fusing-point of iron, the surface of the iron plate becomes partially fused, and a complete union of the two metals is obtained.

By this process the weld is not confined to a simple line as in an ordinary weld, but a third metal or semi-steel is formed, varying in thickness from ⅛ to ⅝ of an inch. By the formation of this anomalous steel the two metals are joined together inseparably, or, in other words, the iron has run into the steel, and steel into the iron. Experiments to tear the two asunder have resulted in the tearing of the iron while the weld remained intact.

The compound armor-plates thus obtained may be rolled to any thickness.

By the invention of compound armor it would seem that the defense is once more placed on an equality with the attack.—*H. T. Stockton, Lieutenant U.S.N.*

Armor, Submarine. The water-tight dress of a diver. See DIVING.

Armorer. A petty officer whose duty it is to keep the small-arms in condition for service. Formerly he was the blacksmith of the ship.

Armorer's Mate. The assistant of the armorer.

Armoric. The language of Brittany, Cornwall, and Wales. The original signification was *maritime.*

Armory. A place reserved for the storage of small-arms.

Arm-rack. A frame, generally vertical, for holding small-arms.

Arms. Weapons of offense and defense. Arms and weapons both signify instruments of offense and defense, but we say fire-*arms*, never fire-*weapons*. Cannons, muskets, pistols, are fire-*arms*; bows and arrows, clubs, stones, are *weapons*. Instruments made on purpose to fight with are called *arms*, or *weapons*; such as are accidentally employed to fight with, *weapons*. (*Mech.*) The two parts of a balance or other lever on opposite sides of the fulcrum.

Armstrong, James, Commodore U.S.N. Born Shelbyville, Ky., January 17, 1794, died Charlestown, Mass., August 27, 1868. Midshipman, November 15, 1809; lieutenant, April 27, 1816; commander, March 3, 1825; captain, September 8, 1841; commodore, July 16, 1866. Captured in the "Frolic" in 1814 by the British frigate "Orpheus," and kept a prisoner until March, 1815. Commanded the East India Squadron 1855–58, and in 1857 attacked and captured the Barrier forts in the Canton River. Compelled by a large rebel force to surrender the Pensacola navy-yard, January 12, 1861.

Armstrong, Sir William George. Noted for various mechanical inventions, and particularly that of a gun of extraordinary power and precision. Born at Newcastle, England, in 1810, was articled to Mr. Armourer Donkin, an eminent solicitor in Newcastle, who, at the expiration of his time, made him a partner. About 1838, observing one day a little stream descending along a height near Newcastle and driving but a single mill, he thought to how much more purpose it might be applied hydraulically, and thus was led into a course of experimenting which resulted in his producing a much improved hydraulic engine. In 1845 he invented a hydraulic crane, which has proved to be of eminent utility in raising weights in harbors. Soon after the invention of the gun which bears his name an office was created for him, that of Chief Engineer of Rifled Ordnance. For description of Armstrong gun, see ORDNANCE.

Army. An armed force under regular military organization employed for national offense or defense. An army may comprise the whole military force employed by a state, or only a portion under a particular commander. A fleet is sometimes called a naval army.

Armye. An early name for a fleet.

Arnot. A shrimp.

Arquebuse. A sort of hand-gun; an old species of fire-arm resembling a musket, and supported upon a forked rest when in use.

Arrack. A spirituous liquor manufactured in the East Indies from various substances, but chiefly from fermented rice and the sap of the cocoa palm.

Arraign. To call, or set as a prisoner, at the bar of the court to answer to the matter charged in an indictment or complaint.

Array. The order of battle. The whole body of officers constituting a court-martial.

To ARRAY. To equip; to arm for battle; to arrange in order of battle.

Arrears. That which is behind in payment, but supposes a part already paid.

Arrest. To suspend from duty, and restrain from liberty, preparatory to a court-martial.

Arrow. A slender shaft to be shot from a bow. It is generally armed at one end and feathered at the other, though the natives of Africa frequently feather the barbed end.

Arsenal. A manufactory or depository for arms and all military equipments.

Artemon. The mainsail of ancient ships.

Articles. The express stipulations to which a seaman binds himself when he joins a merchant ship.

Articles for the Government of the United States Navy. The Navy of the United States shall be governed by the following Articles:

Article 1. The commanders of all fleets, squadrons, naval stations, and vessels belonging to the navy are required to show in themselves a good example of virtue, honor, patriotism, and subordination; to be vigilant in inspecting the conduct of all persons who are placed under their command; to guard against and suppress all dissolute and immoral practices, and to correct, according to the laws and regulations of the navy, all persons who are guilty of them; and any such commander who offends against this article shall be punished as a court-martial may direct.

Article 2. The commanders of vessels and naval stations to which chaplains are attached shall cause divine service to be performed on Sunday, whenever the weather and other circumstances allow it to be done; and it is earnestly recommended to all officers, seamen, and others in the naval service diligently to attend at every performance of the worship of Almighty God.

Article 3. Any irreverent or unbecoming behavior during divine service shall be punished as a general or summary court-martial may direct.

Article 4. The punishment of death, or such other punishment as a court-martial may adjudge, may be inflicted on any person in the naval service—

1. Who makes, or attempts to make, or unites with any mutiny or mutinous assembly, or, being witness to or present at any mutiny, does not do his utmost to suppress it; or, knowing of any mutinous assembly or of any intended mutiny, does not immediately communicate his knowledge to his superior or commanding officer;

2. Or disobeys the lawful orders of his superior officer;

3. Or strikes or assaults, or attempts or threatens to strike or assault his superior officer while in the execution of the duties of his office;

4. Or gives any intelligence to, or holds or entertains any intercourse with, an enemy or rebel, without leave from the President, the Secretary of the Navy, the commander-in-chief of the fleet, the commander of the squadron, or, in case of a vessel acting singly, from his commanding officer;

5. Or receives any message or letter from an enemy or rebel, or, being aware of the unlawful reception of such message or letter, fails to take the earliest opportunity to inform his superior or commanding officer thereof;

6. Or, in time of war, deserts or entices others to desert;

7. Or, in time of war, deserts or betrays his trust, or entices or aids others to desert or betray their trust;

8. Or sleeps upon his watch;

9. Or leaves his station before being regularly relieved;

10. Or intentionally or willfully suffers any vessel of the navy to be stranded, or run upon rocks or shoals, or improperly hazarded; or maliciously or willfully injures any vessel of the navy, or any part of her tackle, armament, or equipment, whereby the safety of the vessel is hazarded or the lives of the crew exposed to danger;

11. Or unlawfully sets on fire, or otherwise unlawfully destroys, any public property not at the time in possession of an enemy, pirate, or rebel;

12. Or strikes or attempts to strike the flag to an enemy or rebel, without proper authority, or, when engaged in battle, treacherously yields or pusillanimously cries for quarter;

13. Or, in time of battle, displays cowardice, negligence, or disaffection, or withdraws from or keeps out of danger to which he should expose himself;

14. Or, in time of battle, deserts his duty or station, or entices others to do so;

15. Or does not properly observe the orders of his commanding officer, and use his utmost exertions to carry them into execution, when ordered to prepare for or join in, or when actually engaged, in battle, or while in sight of an enemy;

16. Or, being in command of a fleet, squadron, or vessel acting singly, neglects, when an engagement is probable, or when an armed vessel of an enemy or rebel is in sight, to prepare and clear his ship or ships for action;

17. Or does not, upon signal for battle, use his utmost exertions to join in battle;

18. Or fails to encourage, in his own person, his inferior officers and men to fight courageously;

19. Or does not do his utmost to overtake and capture or destroy any vessel which it is his duty to encounter;

20. Or does not afford all practicable relief and assistance to vessels belonging to the United States or their allies when engaged in battle.

Article 5. All persons who, in time of war, or of rebellion against the supreme authority of the United States, come or are found in the capacity of spies, or who bring or deliver any seducing letter or message from an enemy or rebel, or endeavor to corrupt any person in the navy to betray his trust, shall suffer death, or such other punishment as a court-martial may adjudge.

Article 6. If any person belonging to any public vessel of the United States commits the crime of murder without the territorial jurisdiction thereof, he may be tried by court-martial and punished with death.

Article 7. A naval court-martial may adjudge the punishment of imprisonment for life, or for a stated term, at hard labor, in any case where it is authorized to adjudge the punishment of death; and such sentences of imprisonment and hard labor may be carried into execution in any prison or penitentiary under the control of the United States, or which the United States may be allowed, by the legislature of any State, to use; and persons so imprisoned in the prison or penitentiary of any State or Territory shall be subject, in all respects, to the same discipline

and treatment as convicts sentenced by the courts of the State or Territory in which the same may be situated.

Article 8. Such punishment as a court-martial may adjudge may be inflicted on any person in the navy—

1. Who is guilty of profane swearing, falsehood, drunkenness, gambling, fraud, theft, or any other scandalous conduct tending to the destruction of good morals;

2. Or is guilty of cruelty toward, or oppression or maltreatment of, any person subject to his orders;

3. Or quarrels with, strikes, or assaults, or uses provoking or reproachful words, gestures, or menaces toward, any person in the navy;

4. Or endeavors to foment quarrels between other persons in the navy;

5. Or sends or accepts a challenge to fight a duel or acts as a second in a duel;

6. Or treats his superior officer with contempt, or is disrespectful to him in language or deportment, while in the execution of his office;

7. Or joins in or abets any combination to weaken the lawful authority of, or lessen the respect due to, his commanding officer;

8. Or utters any seditious or mutinous words;

9. Or is negligent or careless in obeying orders, or culpably inefficient in the performance of duty;

10. Or does not use his best exertions to prevent the unlawful destruction of public property by others;

11. Or, through inattention or negligence, suffers any vessel of the navy to be stranded, or run upon a rock or shoal, or hazarded;

12. Or, when attached to any vessel appointed as convoy to any merchant or other vessels, fails diligently to perform his duty, or demands or exacts any compensation for his services, or maltreats the officers or crews of such merchant or other vessels;

13. Or takes, receives, or permits to be received, on board the vessel to which he is attached, any goods or merchandise, for freight, sale, or traffic, except gold, silver, or jewels, for freight or safe-keeping; or demands or receives any compensation for the receipt or transportation of any other article than gold, silver, or jewels, without authority from the President or Secretary of the Navy;

14. Or knowingly makes or signs, or aids, abets, directs, or procures the making or signing of, any false muster;

15. Or wastes any ammunition, provisions, or other public property; or, having power to prevent it, knowingly permits such waste;

16. Or, when on shore, plunders, abuses, or maltreats any inhabitant, or injures his property in any way;

17. Or refuses, or fails to use, his utmost exertions to detect, apprehend, and bring to punishment all offenders, or to aid all persons appointed for that purpose;

18. Or, when rated or acting as master-at-arms, refuses to receive such prisoners as may be committed to his charge, or, having received them, suffers them to escape, or dismisses them without orders from the proper authority;

19. Or is absent from his station or duty without leave, or after his leave has expired;

20. Or violates or refuses obedience to any lawful general order or regulation issued by the Secretary of the Navy;

21. Or, in time of peace, deserts, or attempts to desert, or aids and entices others to desert;

22. Or receives or entertains any deserter from any other vessel of the navy, knowing him to be such, and does not, with all convenient speed, give notice of such deserter to the commander of the vessel to which he belongs, or to the commander-in-chief, or to the commander of the squadron.

Article 9. Any officer who absents himself from his command without leave may, by the sentence of a court-martial, be reduced to the rating of an ordinary seaman.

Article 10. Any commissioned officer of the navy or marine corps who, having tendered his resignation, quits his post or proper duties without leave, and with intent to remain permanently absent therefrom, prior to due notice of the acceptance of such resignation, shall be deemed and punished as a deserter.

Article 11. No person in the naval service shall procure stores or other articles or supplies for, and dispose thereof to, the officers or enlisted men on vessels of the navy, or at navy-yards or naval stations, for his own account or benefit.

Article 12. No person connected with the navy shall, under any pretense, import in a public vessel any article which is liable to the payment of duty.

Article 13. Distilled spirits shall be admitted on board of vessels of war only upon the order and under the control of the medical officers of such vessels, and to be used only for medical purposes.

Article 14. Fine and imprisonment, or such other punishment as a court-martial may adjudge, shall be inflicted upon any person in the naval service of the United States—

Who presents or causes to be presented to any person in the civil, military, or naval service thereof, for approval or payment, any claim against the United States or any officer thereof, knowing such claim to be false or fraudulent; or

Who enters into any agreement or conspiracy to defraud the United States by obtaining, or aiding others to obtain, the allowance or payment of any false or fraudulent claim; or

Who, for the purpose of obtaining, or aiding others to obtain, the approval, allowance, or payment of any claim against the United States, or against any officer thereof, makes or uses, or procures or advises the making or use of, any writing or other paper, knowing the same to contain any false or fraudulent statement; or

Who, for the purpose of obtaining, or aiding others to obtain, the approval, allowance, or payment of any claim against the United States or any officer thereof, makes or procures or advises the making of any oath to any fact, or to any writing or other paper, knowing such oath to be false; or

Who, for the purpose of obtaining, or aiding others to obtain, the approval, allowance, or payment of any claim against the United States or any officer thereof, forges or counterfeits, or procures or advises the forging or counterfeiting of any signature upon any writing or other paper, or uses or procures or advises the use of any such signature, knowing the same to be forged or counterfeited; or

Who, having charge, possession, custody, or control of any money or other property of the United States, furnished or intended for the naval service thereof, knowingly delivers, or causes to be delivered, to any person having authority to receive the same, any amount thereof less than that for which he receives a certificate or receipt; or

Who, being authorized to make or deliver any paper certifying the receipt of any money or other property of the United States, furnished or intended for the naval service thereof, makes or delivers to any person such writing, without having full knowledge of the truth of the statement therein contained, and with intent to defraud the United States; or

Who steals, embezzles, knowingly and willfully misappropriates, applies to his own use or benefit, or wrongfully and knowingly sells or disposes of any ordnance, arms, equipments, ammunition, clothing, subsistence stores, money, or other property of the United States, furnished or intended for the military or naval service thereof; or

Who knowingly purchases, or receives in pledge for any obligation or indebtedness, from any other person who is a part of, or employed in, said service, any ordnance, arms, equipments, ammunition, clothing, subsistence stores, or other property of the United States, such other person not having lawful right to sell or pledge the same; or

Who executes, attempts, or countenances any other fraud against the United States.

And if any person, being guilty of any of the offenses described in this article while in the naval service, receives his discharge, or is dismissed from the service, he shall continue to be liable to be arrested and held for trial and sentence by a court-martial, in the same manner and to the same extent as if he had not received such discharge nor been dismissed.

Article 15. The commanding officer of every vessel in the navy entitled to or claiming an award of prize-money, shall, as soon as may be practicable after the capture, transmit to the Navy Department a complete list of the officers and men of his vessel entitled to share, stating therein the quality of each person rating; and every commanding officer who offends against this article shall be punished as a court-martial may direct.

Article 16. No person in the navy shall take out of a prize, or vessel seized as a prize, any money, plate, goods, or any part of her equipment, unless it be for the better preservation thereof, or unless such articles are absolutely needed for the use of any of the vessels or armed forces of the United States, before the same are adjudged lawful prize by a competent court; but the whole, without fraud, concealment, or embezzlement, shall be brought in, in order that judgment may be passed thereon; and every person who offends against this article shall be punished as a court-martial may direct.

Article 17. If any person in the navy strips off the clothes of, or pillages, or in any manner maltreats any person taken on board a prize, he shall suffer such punishment as a court-martial may adjudge.

Article 18. If any officer or person in the naval service employs any of the forces under his command for the purpose of returning any fugitive from service or labor, he shall be dismissed from the service.

Article 19. Any officer who knowingly enlists into the naval service any deserter from the naval or military service of the United States, or any insane or intoxicated person, or any minor between the ages of 16 and 18 years without the consent of his parents or guardian, or any minor under the age of 16 years, shall be dishonorably dismissed from the service of the United States.

Article 20. Every commanding officer of a vessel in the navy shall obey the following rules:

1. Whenever a man enters on board, the commanding officer shall cause an accurate entry to be made in the ship's books, showing his name, the date, place, and term of his enlistment, the place or vessel from which he was received on board, his rating, his descriptive list, his age, place of birth, and citizenship, with such remarks as may be necessary.

2. He shall, before sailing, transmit to the Secretary of the Navy a complete list of the rated men under his command, showing the particulars set forth in rule one, and a list of officers and passengers, showing the date of their entering. And he shall cause similar lists to be made out on the first day of every third month and transmitted to the Secretary of the Navy as opportunities occur, accounting therein for any casualty which may have happened since the last list.

3. He shall cause to be accurately minuted on the ship's books the names of any persons dying or deserting, and the times at which such death or desertion occurs.

4. In case of the death of any officer, man, or passenger on said vessel, he shall take care that the paymaster secures all the property of the deceased, for the benefit of his legal representatives.

5. He shall not receive on board any man transferred from any other vessel or station to him, unless such man is furnished with an account, signed by the captain and paymaster of the vessel or station from which he came, specifying the date of his entry on said vessel or at said station, the period and term of his service, the sums paid him, the balance due him, the quality in which he was rated, and his descriptive list.

6. He shall, whenever officers or men are sent from his ship, for whatever cause, take care that each man is furnished with a complete statement of his account, specifying the date of his enlistment, the period and term of his service, and his descriptive list. Said account shall be signed by the commanding officer and paymaster.

7. He shall cause frequent inspections to be made into the condition of the provisions on his ship, and use every precaution for their preservation.

8. He shall frequently consult with the surgeon in regard to the sanitary condition of his crew, and shall use all proper means to preserve their health. And he shall cause a convenient place to be set apart for sick or disabled men, to which he shall have them removed, with their hammocks and bedding, when the surgeon so advises, and shall direct that some of the crew attend them and keep the place clean.

9. He shall attend in person, or appoint a

proper officer to attend, when his crew is finally paid off, to see that justice is done to the men and to the United States in the settlement of the accounts.

10. He shall cause the articles for the government of the navy to be hung up in some public part of the ship, and read once a month to his ship's company.

Every commanding officer who offends against the provisions of this article shall be punished as a court-martial may direct.

Article 21. When the crew of any vessel of the United States are separated from their vessel by means of her wreck, loss, or destruction, all the command and authority given to the officers of such vessel shall remain in full force until such ship's company shall be regularly discharged from or ordered again into service, or until a court-martial or court of inquiry shall be held to inquire into the loss of said vessel. And if any officer or man, after such wreck, loss, or destruction, acts contrary to the discipline of the navy, he shall be punished as a court-martial may direct.

Article 22. All offenses committed by persons belonging to the navy which are not specified in the foregoing articles shall be punished as a court-martial may direct.

Article 23. All offenses committed by persons belonging to the navy while on shore shall be punished in the same manner as if they had been committed at sea.

Article 24. No commander of a vessel shall inflict upon a commissioned or warrant officer any other punishment than private reprimand, suspension from duty, arrest, or confinement, and such suspension, arrest, or confinement shall not continue longer than ten days, unless a further period is necessary to bring the offender to trial by a court-martial; nor shall he inflict, or cause to be inflicted, upon any petty officer, or person of inferior rating, or marine, for a single offense, or at any one time, any other than one of the following punishments, namely:

1. Reduction of any rating established by himself.
2. Confinement, with or without irons, single or double, not exceeding ten days, unless further confinement be necessary, in the case of a prisoner to be tried by court-martial.
3. Solitary confinement, on bread and water, not exceeding five days.
4. Solitary confinement not exceeding seven days.
5. Deprivation of liberty on shore.
6. Extra duties.

No other punishment shall be permitted on board of vessels belonging to the navy, except by sentence of a general or summary court-martial. All punishments inflicted by the commander, or by his order, except reprimands, shall be fully entered upon the ship's log.

Article 25. No officer who may command by accident, or in the absence of the commanding officer, except when such commanding officer is absent for a time by leave, shall inflict any other punishment than confinement.

Article 26. Summary courts-martial may be ordered upon petty officers and persons of inferior ratings by the commander of any vessel, or by the commandant of any navy-yard, naval station, or marine barracks to which they belong, for the trial of offenses which such officer may deem deserving of greater punishment than such commander or commandant is authorized to inflict, but not sufficient to require trial by a general court-martial.

Article 27. A summary court-martial shall consist of three officers not below the rank of ensign, as members, and of a recorder. The commander of a ship may order any officer under his command to act as such recorder.

Article 28. Before proceeding to trial the members of a summary court-martial shall take the following oath or affirmation, which shall be administered by the recorder: "I, A B, do swear (or affirm) that I will well and truly try, without prejudice or partiality, the case now depending, according to the evidence which shall be adduced, the laws for the government of the navy, and my own conscience." After which the recorder of the court shall take the following oath or affirmation, which shall be administered by the senior member of the court: "I, A B, do swear (or affirm) that I will keep a true record of the evidence which shall be given before this court and of the proceedings thereof."

Article 29. All testimony before a summary court-martial shall be given orally, upon oath or affirmation, administered by the senior member of the court.

Article 30. Summary courts-martial may sentence petty officers and persons of inferior ratings to any one of the following punishments, namely:

1. Discharge from the service with bad-conduct discharge; but the sentence shall not be carried into effect in a foreign country;
2. Solitary confinement, not exceeding thirty days, in irons, single or double, on bread and water, or on diminished rations;
3. Solitary confinement, in irons, single or double, not exceeding thirty days;
4. Solitary confinement not exceeding thirty days;
5. Confinement not exceeding two months;
6. Reduction to next inferior rating;
7. Deprivation of liberty on shore on foreign station;
8. Extra police duties, and loss of pay, not to exceed three months, may be added to any of the above-mentioned punishments.

Article 31. A summary court-martial may disrate any rated person for incompetency.

Article 32. No sentence of a summary court-martial shall be carried into execution until the proceedings and sentence have been approved by the officer ordering the court and by the commander-in-chief, or, in his absence, by the senior officer present. And no sentence of such court which involves loss of pay shall be carried into execution until the proceedings and sentence have been approved by the Secretary of the Navy.

Article 33. The officer ordering a summary court-martial shall have power to remit, in part, or altogether, but not to commute, the sentence of the court. And it shall be his duty either to remit any part or the whole of any sentence the execution of which would, in the opinion of the surgeon or senior medical officer on board, given in writing, produce serious injury to the health of the person sentenced; or to submit the case again, without delay, to the same or to another summary court-martial, which shall have power,

upon the testimony already taken, to remit the former punishment; and to assign some other of the authorized punishments in the place thereof.

Article 34. The proceedings of summary courts-martial shall be conducted with as much conciseness and precision as may be consistent with the ends of justice, and under such forms and rules as may be prescribed by the Secretary of the Navy, with the approval of the President; and all such proceedings shall be transmitted, in the usual mode, to the Navy Department.

Article 35. Any punishment which a summary court-martial is authorized to inflict may be inflicted by a general court-martial.

Article 36. No officer shall be dismissed from the naval service except by the order of the President or by sentence of a general court-martial; and in time of peace no officer shall be dismissed except in pursuance of the sentence of a general court-martial or in mitigation thereof

Article 37. When any officer, dismissed by order of the President since 3d March, 1865, makes, in writing, an application for trial, setting forth, under oath, that he has been wrongfully dismissed, the President shall, as soon as the necessities of the service may permit, convene a court-martial to try such officer on the charges on which he shall have been dismissed. And if such court-martial shall not be convened within six months from the presentation of such application for trial, or if such court, being convened, shall not award dismissal or death as the punishment of such officer, the order of dismissal by the President shall be void.

Article 38. General courts-martial may be convened by the President, the Secretary of the Navy, or the commander-in-chief of a fleet or squadron; but no commander of a fleet or squadron in the waters of the United States shall convene such court without express authority from the President.

Article 39. A general court-martial shall consist of not more than thirteen nor less than five commissioned officers as members; and as many officers, not exceeding thirteen, as can be convened without injury to the service, shall be summoned on every such court. But in no case, where it can be avoided without injury to the service, shall more than one-half, exclusive of the president, be junior to the officer to be tried. The senior officer shall always preside, and the others shall take place according to their rank.

Article 40. The president of the general court-martial shall administer the following oath or affirmation to the judge-advocate or person officiating as such:

"I, A B, do swear (or affirm) that I will keep a true record of the evidence given to and the proceedings of this court; that I will not divulge or by any means disclose the sentence of the court until it shall have been approved by the proper authority; and that I will not at any time divulge or disclose the vote or opinion of any particular member of the court, unless required so to do before a court of justice in due course of law."

This oath or affirmation being duly administered, each member of the court, before proceeding to trial, shall take the following oath or affirmation, which shall be administered by the judge-advocate or person officiating as such:

"I, A B, do swear (or affirm) that I will truly try, without prejudice or partiality, the case now depending, according to the evidence which shall come before the court, the rules for the government of the navy, and my own conscience; that I will not by any means divulge or disclose the sentence of the court until it shall have been approved by the proper authority; and that I will not at any time divulge or disclose the vote or opinion of any particular member of the court, unless required so to do before a court of justice in due course of law."

Article 41. An oath or affirmation in the following form shall be administered to all witnesses, before any court-martial, by the president thereof:

"You do solemnly swear (or affirm) that the evidence you shall give in the case now before this court shall be the truth, the whole truth, and nothing but the truth, and that you will state everything within your knowledge in relation to the charges: so help you God; (or, 'this you do under the pains and penalties of perjury.')"

Article 42. Whenever any person refuses to give his evidence or to give it in the manner provided by these articles, or prevaricates, or behaves with contempt to the court, it shall be lawful for the court to imprison him for any time not exceeding two months.

Article 43. The person accused shall be furnished with a true copy of the charges, with the specifications, at the time he is put under arrest; and no other charges than those so furnished shall be urged against him at the trial, unless it shall appear to the court that intelligence of such other charge had not reached the officer ordering the court when the accused was put under arrest, or that some witness material to the support of such charge was at that time absent and can be produced at the trial; in which case reasonable time shall be given to the accused to make his defense against such new charge.

Article 44. Every officer who is arrested for trial shall deliver up his sword to his commanding officer, and confine himself to the limits assigned him, on pain of dismissal from the service.

Article 45. When the proceedings of any general court-martial have commenced, they shall not be suspended or delayed on account of the absence of any of the members, provided five or more are assembled; but the court is enjoined to sit from day to day, Sundays excepted, until sentence is given, unless temporarily adjourned by the authority which convened it.

Article 46. No member of a general court-martial shall, after the proceedings are begun, absent himself therefrom, except in case of sickness, or of an order to go on duty from a superior officer, on pain of being cashiered.

Article 47. Whenever any member of a court-martial, from any legal cause, is absent from the court after the commencement of a case, all the witnesses who have been examined during his absence must, when he is ready to resume his seat, be recalled by the court, and the recorded testimony of each witness so examined must be read over to him, and such witness must acknowledge the same to be correct, and be subject to such further examination as the said member may require. Without a compliance with this rule, and an entry thereof upon the record, a member who shall have been absent during the

examination of a witness shall not be allowed to sit again in that particular case.

Article 48. Whenever a court-martial sentences an officer to be suspended, it may suspend his pay and emoluments for the whole or any part of the time of his suspension.

Article 49. In no case shall punishment by flogging, or by branding, marking, or tattooing on the body be adjudged by any court-martial or be inflicted upon any person in the navy.

Article 50. No person shall be sentenced by a court-martial to suffer death, except by the concurrence of two-thirds of the members present, and in the cases where such punishment is expressly provided in these articles. All other sentences may be determined by a majority of votes.

Article 51. It shall be the duty of a court-martial, in all cases of conviction, to adjudge a punishment adequate to the nature of the offense; but the members thereof may recommend the person convicted as deserving of clemency, and state on the record their reasons for so doing.

Article 52. The judgment of every court-martial shall be authenticated by the signature of the president, and of every member who may be present when said judgment is pronounced, and also of the judge-advocate.

Article 53. No sentence of a court-martial, extending to the loss of life or to the dismissal of a commissioned or warrant officer, shall be carried into execution until confirmed by the President. All other sentences of general court-martial may be carried into execution on confirmation of the commander of the fleet or officer ordering the court.

Article 54. Every officer who is authorized to convene a general court-martial shall have power, on revision of its proceedings, to remit or mitigate, but not to commute, the sentence of any such court which he is authorized to approve and confirm.

Article 55. Courts of inquiry may be ordered by the President, the Secretary of the Navy, or the commander of a fleet or squadron.

Article 56. A court of inquiry shall consist of not more than three commissioned officers as members, and of a judge-advocate, or person officiating as such.

Article 57. Courts of inquiry shall have power to summon witnesses, administer oaths, and punish contempts in the same manner as courts-martial; but they shall only state facts, and shall not give their opinion, unless expressly required so to do in the order for convening.

Article 58. The judge-advocate, or person officiating as such, shall administer to the members the following oath or affirmation: "You do swear (or affirm) well and truly to examine and inquire, according to the evidence, into the matter now before you, without partiality." After which the president shall administer to the judge-advocate, or person officiating as such, the following oath or affirmation: "You do swear (or affirm) truly to record the proceedings of this court, and the evidence to be given in the case in hearing."

Article 59. The party whose conduct shall be the subject of inquiry, or his attorney, shall have the right to cross-examine all the witnesses.

Article 60. The proceedings of courts of inquiry shall be authenticated by the signature of the president of the court and of the judge-advocate, and shall, in all cases not capital, nor extending to the dismissal of a commissioned or warrant officer, be evidence before a court-martial, provided oral testimony cannot be obtained.

Artificer. One who works by hand in wood or metal.

Artificial. Made by art; not genuine.

ARTIFICIAL GLOBE. A spherical representation of the earth or the heavens.

ARTIFICIAL SINES, TANGENTS, ETC. The logarithms of the natural sines, tangents, etc.

ARTIFICIAL NUMBERS. Logarithms.

ARTIFICIAL LINES. Lines on a sector or scale, so contrived as to represent logarithmic signs and tangents, which, by the help of the line of numbers, solve, with tolerable exactness, problems in trigonometry and navigation.

ARTIFICIAL EYE. An eye worked in the end of a rope. It is neater but not so strong as a spliced eye.

Artificial Horizon. A reflector whose surface is perfectly horizontal, used for observing altitudes. Artificial horizons are of two kinds,—those for use on shore, and those for use on board ship.

The most usual form of the shore artificial horizon is a rectangular trough of quicksilver or other fluid. Quicksilver is the fluid most convenient and the best adapted for obtaining a surface which shall quickly subside after being disturbed. No altitude can be observed which is greater than half the range of the instrument; thus, with a sextant no altitude above 60° can be observed. For altitudes less than 15° the observation is generally impracticable. One advantage of the artificial horizon is, that when the angle shown by the instrument is halved to obtain the angle of elevation, all errors of observation are halved at the same time. There is no correction for "dip." The instrument used for observing is sometimes fixed upon a small pillar. In this artificial horizon an essential condition is the parallelism of the faces of plate-glass forming the roof. The effects of refraction may be practically eliminated by these plates being made circular disks which admit of being turned in their own plane. One set of observations having been taken, the plates are turned through 180° and a new set taken, the two being used in combination; or with a common roof the error may be practically eliminated by reversing it. A small mirror of polished metal or of darkened plate-glass is sometimes used as an artificial horizon, its horizontality being ascertained by means of a spirit-level placed upon it, and the adjustment effected by means of screws which form its stand. Such an instrument, though convenient and portable, does not give satisfactory results.

At sea the celestial bodies are sometimes distinctly visible when the horizon is enveloped in mist; the sea-horizon is often disturbed by haze or fog, and by moonlight is often uncertain. Hence the attempts to invent an artificial horizon adapted for use on board ship. Mr. Serson suggested to apply the principle upon which a top, when spinning, tends to preserve a vertical position. A pivot carrying a mirror thus rotating would theoretically give the horizontal reflector required; but it failed in practice. Admiral Beechey's contrivance is more successful.

The telescope of the sextant is fitted with a balance carrying a glass vane, one half of which is colored blue to represent the sea-horizon, and to which the celestial object is brought down. The amount of oscillation above and below the level is indicated by divisions on the glass, the values of which are determined by the maker. Other constructions, where the horizon is attached to the sextant, have been tried with more or less success.

Artillery. Formerly synonymous with archery, but now comprehends everything relating to guns and to the service of guns.

Arx. A fort or castle.

Ascii. The inhabitants of the torrid zone, who, being twice a year under a vertical sun, have no shadow.

Ashes. The earthy part of combustible substances remaining after combustion.

ASH-PIT. The space underneath the grate-bars.

ASH-CHUTE. A receptacle into which ashes are dumped to be conveyed overboard.

ASH-WHIP. A whip for hoisting ashes out of the fire-room.

Ashlar. Blocks of stone masonry fronting docks and piers.

Ashore. On land,—opposed to *aboard;* when applied to a ship, means that she is aground.

Asia. See CONTINENTS.

Asiento. A contract between the king of Spain and other powers, for furnishing the Spanish dominions in America with negro slaves. It began in 1689, and was vested in the South Sea Company in 1713. By the treaty of Utrecht it was transferred to the English, who were to furnish 4800 negroes annually to Spanish America. This contract was given up to Spain at the peace in 1748.

Askew. Awry; aslant.

Aslant. Obliquely.

SAILING ASLANT. Beating to windward.

Asleep. A sail filled with just enough wind for swelling or bellying out is said to be asleep.

Aspect. The general appearance of the land from seaward.

Aspic. An ancient 12-pounder about 11 feet long.

Aspinwall. A seaport of the United States of Colombia, on the Atlantic side of the Isthmus of Panama. The harbor has a depth of water sufficient for the largest ships, and is very spacious. Pop. 2500.

Aspirant de Marine. (*Fr.*) Midshipman.

Assail. To attack with violence or in a hostile manner.

Assault. A hostile attack. An effort to gain possession of a fortification by main force.

Assegai. A spear or javelin used by the Zulus.

Asseguay. A dagger used in the Levant.

Assembly. A beat of the drum or call on the bugle, as a signal to troops to assemble.

Assilag. A name given in the Hebrides to a small bird with a black bill. The stormy petrel.

Assistant. See SURGEON, PAYMASTER, ENGINEER.

Assurance. Insurance. A contract to pay a certain sum on the occasion of a certain event; as, loss or death.

Assurgent. A heraldic term for a man or beast rising out of the sea.

A-starboard. The situation of the helm when the tiller is borne over to the starboard side of the ship.

HARD A-STARBOARD. The order to put the helm over to the extreme limit.

Astatic Needle. See NEEDLE.

A-stay. The anchor is said to be *a-stay* when the cable forms an acute angle with the surface of the water. *A long stay* signifies that the cable forms a line parallel with the main-stay, and *a short stay* means that it is parallel with the fore-stay.

Asteria. A genus of radiated marine animals; the star-fish.

Asterism. A constellation; a group of stars.

Astern. Any distance behind a vessel in the direction of the stern.

TO DROP ASTERN. To be left behind.

TO BE ASTERN OF THE RECKONING. To be behind the position determined by logging.

Asteroid. The name which Herschel proposed to give the minor planets which have been discovered between the orbits of Mars and Jupiter. The first one was discovered in 1801, but since that time over 80 have been added to the number. The largest one is but 300 miles in diameter. They closely resemble small stars, and can only be distinguished from them by their motion.

Astragal. Mouldings on old cannon.

Astral. Relating to the stars.

Astrolabe. The armillary sphere.

A *sea-astrolabe* is a brass ring with a movable arm, for observing altitudes of stars and planets.

Astrology. Formerly synonymous with astronomy; subsequently, the art of foretelling events by the positions and aspects of the stars. Judicial astrology was invented by the Chaldæans, and hence was transmitted to the Egyptians, Greeks, and Romans. It was much in vogue in France in the time of Catherine de Medicis, 1533. The early history of astrology in England is very little known: Bede was addicted to it, 700; and so was Roger Bacon, 1260. Cecil, Lord Burleigh, calculated the nativity of Elizabeth; and she, and all the European princes, were the humble servants of Dee, the astrologer and conjurer. But the period of the Stuarts was the acme of astrology in England. Sir Walter Scott has made ample use of Sir William Lilly, the noted astrologer, in his tales of this period; and it is certain that Lilly was consulted by Charles I. respecting his projected escape from Carisbrook Castle in 1647.

Astronomical Clock. A pendulum clock regulated to sidereal time. The *error* is its difference from sidereal time, and the *rate* is the daily change of error.

The *Astronomical Day* begins at noon, and the hours are numbered from one to twenty-four.

Astronomicals. Sexagesimal fractions.

Astronomy. (Gr. *aster*, a star, any luminary body; *nomos*, a law.) The science which treats of the heavenly bodies. It is generally divided into *Spherical Astronomy*, which treats of the appearances, magnitudes, motions, and distances of the heavenly bodies; and *Physical Astronomy*, which applies the principles of mechanics to explain the motions of the heavenly bodies and the laws by which they are governed. That portion of spherical astronomy which is applied to purposes of navigation is called *Nautical*

Astronomy. See Sun, Planets, Asteroid, Stars, Comets, Eclipses, etc.

The earliest astronomical observations were made at Babylon, it is said, about 2234 B.C. The study was much advanced in Chaldæa under Nabonassar; was known to the Chinese about 1100 B.C., some say centuries before.

Lunar eclipses observed at Babylon, and recorded by Ptolemy, about 720 B.C.

Spherical form of the earth and the true cause of lunar eclipses taught by Thales, about 600 B.C.

Further discoveries by Pythagoras, who taught the doctrine of celestial motions and believed in the plurality of habitable worlds, died about 470 B.C.

Meton introduces the lunar-solar cycle, 433 B.C.

Treatises of Aristotle "concerning the heavens," and of Autolycus "on the motion of the sphere" (earliest extant works on astronomy), about 350 B.C.

Aratus writes a poem on astronomy about 281 B.C.

Archimedes observes solstices, etc., about 212 B.C.

Hipparchus, greatest of Greek astronomers, determines mean motion of sun and moon; discovers precession of equinoxes, etc., about 160–125 B.C.

The precession of the equinoxes confirmed, and the places and distances of the planets discovered by Ptolemy, 139–161 A.D.

Astronomy and geography cultivated by the Arabs about 760 A.D.; brought into Europe about 1200 A.D.

Clocks first used in astronomy about 1500 A.D.

True doctrine of the motions of the planetary bodies revived by Copernicus, founder of modern astronomy; his "Revolution of the Heavenly Bodies" published 1543 A.D.

Astronomy advanced by Tycho Brahe, who yet adheres to the Ptolemaic system, about 1582 A.D.

True laws of the planetary motions announced by Kepler; 1st and 2d, 1609 A.D; 3d, 1618 A.D.

Galileo constructs a telescope, 1609; and discovers Jupiter's satellites, etc., 8th January, 1610 A.D.

Various forms of telescopes and other instruments used in astronomy invented, 1608–40 A.D.

Cartesian system published by Des Cartes, 1637 A.D.

The transit of Venus over the sun's disk first observed by Horrocks, 24th November, 1639 A.D

Cassini draws his meridian line after Dante, 1655 A.D.

The aberration of the light of the fixed stars discovered by Horrebow, 1659 A.D.

Huyghens completes the discovery of Saturn's ring, 1654 A.D.

Gregory invents a reflecting telescope, 1663 A.D.

Charts of the moon constructed by Scheiner, Langrenus, Hevelius, Riccioli, etc., about 1670 A.D.

Discoveries of Römer on the velocity of light, and his observation of Jupiter's satellites, 1675 A.D.

Motion of the sun round its own axis proved by Halley, 1676 A.D.

Newton's "Principia" published, and the system as now taught demonstrated, 1687 A.D.

Catalogue of the stars made by Flamsteed, 1688 A.D.

Cassini's chart of the full moon executed, 1692 A.D.

Satellites of Saturn, etc., discovered by Cassini, 1701 A.D.

Halley predicts the return of the comet (of 1759), 1705 A.D.

Flamsteed's "Historia Cœlestis" published, 1725 A.D.

Aberration of the light of the stars discovered and explained by Dr. Bradley, 1727 A.D.

John Harrison produces chronometers for determining the longitude, 1735 *et seq.*, and obtains the reward, 1764 A.D.

Celestial inequalities found by La Grange, 1780 A.D.

Uranus and satellites discovered by Herschel, 13th March, 1781 A.D.

"Mécanique céleste," by La Place, published 1796 A.D.

Beer and Mädler's map of the moon published, 1834 A.D.

Lord Rosse's telescope constructed, 1828–45 A.D.

The planet Neptune discovered, 23d September, 1846 A.D.

Bond photographs the moon, 1851 A.D.

Hansen's table of the moon published at expense of the British government, 1857 A.D.

Spectrum analysis applied in astronomy, 1861 A.D.

Astrum, or Astron. Sirius, the Dog-star. A cluster of stars.

Aswim. Afloat.

Asylum. A place of refuge.

Asylum, Naval, of the United States. This important and interesting institution has been in existence about half a century, and is situated upon the banks of the Schuylkill, within the limits of the city of Philadelphia, and in the old district of Passyunk.

The property upon which the institution is situated comprises an irregular plat of about 23 acres, bounded by the Gray's Ferry Road, Bainbridge Street, Southerland Avenue (running parallel with the Schuylkill River), and a wall running thence eastward to meet the Gray's Ferry Road again.

Originally a part of a tract of 150 acres, extending from the Schuylkill to Long Lane, it was, long previous to the Revolution, the site of a handsome country-seat, belonging to the Pemberton family, it having been purchased from the Penns in 1735.

The place, which was known as "Plantation," was then quite remote from the built-up parts of the town, and, in spite of its name, appears never to have been a farm, but to have been taken up with lawns, shrubberies, and gardens. The house was of brick; large, square, roomy, and comfortable. This mansion was afterwards, and previous to the erection of the present large building, the naval asylum and hospital. Two brick tenement or servants' houses stood to the north of the mansion, and were also used until superseded by the present building. When demolished, their *débris* was used by Commodore Biddle to metal the roads and walks which now exist.

"Plantation" was a favorite residence for some of the British officers during their occupation of Philadelphia, and there is frequent mention of it in contemporary journals and correspondence. Soldiers were flogged, and one or two hung for depredations upon the gardens and

smoke-houses, and Mrs. Pemberton, whose husband was absent, extorted an ample apology from a certain Lord Murray, who had treated the tenants with "barbarious and unbecoming behavior, very unworthy of a British nobleman and officer, after being previously shown General Howe's protection posted up in the house." For some time previous to the evacuation the house was occupied by General Pattison, the commander of the Royal Artillery.

From the Pembertons the place passed to the Abbots, and was purchased from that family by the government.

On May 26, 1826, Surgeon Thomas Harris, of the navy, was authorized by the Hon. Samuel L. Southard, Secretary of the Navy, to purchase "the Abbot lot, of about 23 acres, for $16,000." From the accounts it appears that $17,000 was ultimately paid, however,—a very small sum compared with the value of the land at this day.

As soon as it was established that we were to have a permanent naval force, it became necessary to make provision for the sick, wounded, and disabled. In 1798 an act of Congress provided that 20 cents a month should be deducted from the pay of all seamen of the merchant marine for the relief of the sick and disabled, the money to be in charge of the Secretary of the Treasury. And in the next year—1799—its benefits were extended to the "officers, seamen, and marines of the navy, who were to receive the same relief as the sick and disabled seamen of the merchant service."

Under the working of this law naval seamen were sent to civil hospitals, where their officers lost control of them, and they disappeared. Nor did it seem proper that officers, seamen, and marines of a military service should, as an afterthought, be foisted upon the Treasury Department. It was evidently necessary for the navy to have a hospital department of its own, in charge of its own medical officers, who, from being identified with the service, could sympathize with and understand the virtues and failings of the seamen. Accordingly, in 1810, an act of Congress appointed the Secretaries of War, the Navy, and the Treasury a "Board of Commissioners of Naval Hospitals," and the fund derived from monthly assessments upon all persons in the naval service was turned over to them, to constitute a "Naval Hospital Fund," and $50,000 from the unexpended balance of the "Marine Hospital Fund" was placed by the same act in their hands, this being the estimated share of the amount which had accrued since the acts of 1798–99.

From this act of 1810 dates the origin of the Naval Asylum, as well as of all the rest of our naval hospitals.

Mr. Paul Hamilton, then Secretary of the Navy, addressed a letter to the House Committee on the Naval Establishment warmly supporting naval hospitals as places of relief and maintenance, not only for the sick of the service, but for the disabled and infirm who should prefer it to a pension. He even recommended that the widows and children of seamen killed in action should be supported in such institutions, the boys to be brought up for the naval service. He also recommends that the midshipmen should be sent to these hospitals for a period of instruction in navigation and general learning.

On February 26, 1811, the commissioners of naval hospitals were authorized to acquire sites, and to buy or build hospitals, and this same act requires one of these establishments to provide a permanent "asylum" for "decrepid and disabled naval officers, seamen, and marines."

"Asylum" is thus used in the first law upon the subject. It seems an unfortunate term, although truly expressing the intent of the charity.

In the year 1826, as has been said, Dr. Harris bought the asylum property, and the hospital at the navy-yard, on the Delaware, was abandoned, and the Pemberton mansion used instead; and continued in use until 1833, when the present asylum building was sufficiently finished for occupation.

In the records of the hospital from 1826 to 1833 appear the names, as patients, of Farragut, Bainbridge, Twiggs, Hull, Levy, Izard, Newell, Ogden, Howard, P. Voorhees, Engle, Mercer, and other well-known officers.

The government selected the Philadelphia Hospital as the one which was to be the "asylum" directed by the act of 1811; and from the correspondence, it is clear that Dr. Harris is responsible for the selection of the site upon the Gray's Ferry Road, it being already in possession and occupied for hospital purposes. He was detailed by the Secretary of the Navy to superintend the construction, receiving a certain sum, over and above his pay, therefor. Mr. Strickland, the architect, was associated with him in the superintendence.

In 1832 the asylum building was under roof; and up to this time the expense had been wholly borne by the "Naval Hospital Fund," which had become so drained that, in July of that year, a bill passed Congress appropriating $27,300 for "completing the navy asylum at Philadelphia," and $6600 for "fixtures, furniture, and apparatus." During the time the asylum was being built the naval hospitals at Chelsea, Brooklyn, Norfolk, and Pensacola were going up, under regular annual appropriations.

In this same year—1832—there was a transfer, by act of Congress, of all powers of commissioners of hospitals to the Secretary of the Navy. They were directed to turn over to him all cash and evidences of value previously held by them jointly for "the payment of navy and privateer pensions, and for expenditures on account of naval hospitals." The Secretary of the Navy was henceforth to keep this fund as sole commissioner, reporting annually to Congress, as he does to this day.

The asylum building, though by no means completed internally, was occupied toward the close of 1833. From that time until 1842 an aggregate of $93,000 was appropriated for the building, grounds, etc.

According to the report of the architect, the building cost $195,600, and adding the cost of the land brings the total to $212,600, of which four-ninths came from appropriations, and the rest from the hospital fund.

The building faces nearly east, and is constructed of a grayish-white marble, with a granite basement. It is 380 feet in length, and consists of a central building, with a high, broad flight of marble steps, and imposing abutments, and a marble colonnade and pediment, in the bastard classic style, which was the fashion at

the period of its erection, and which has fastened upon the country numbers of solid and costly buildings, utterly unsuited to our climate, and unsightly from lack of fitness.

The wings are symmetrical, and terminate in pavilions, or transverse buildings at each end. These wings are supplied with broad covered verandas on each of the two main floors, which are admirably adapted to their purpose, and, of course, entirely out of keeping with the classic central structure.

A fine attic and basement complete the building, which is most thoroughly and substantially constructed in every part. The marble staircases of the interior are especially noticeable from their ingenious construction and economy of space. The ceilings of two floors are vaulted in solid masonry, and there is a remarkably fine, lofty domed apartment, used as a muster-room and chapel.

The beneficiaries, as they are called, have each a small room, and the use of several reading- and smoking-rooms in the pavilions, beside which there are quarters for officers and employés.

When the asylum was first occupied four beneficiaries were transferred to it from the old building, as were the sick of the station.

The whole of the interior was not finished until 1848, when the increase in the number of inmates rendered it necessary. For many years —from 1840 to the close of the civil war—the second floor of the south wing and the rooms in the pavilion were used as the hospital proper. During the war much of the attic was also so used. For many years the beneficiaries were supported in the same way, and from the same fund as patients in hospital. In 1842 their number was 42, and in 1858 there were considerably over 100; and in the latter year the hospital fund was relieved by an appropriation "for support of beneficiaries, $26,392;" and ever since a separate and specific annual appropriation has been made for the same purpose. The annual appropriation, from the naval pension fund, is now about $60,000.

The first "Governor" of the Naval Asylum was Commodore James Biddle, who was appointed by Secretary J. K. Paulding, upon complaint and scandal resulting from the administration of an old lieutenant who had charge of the beneficiaries as "superintendent." The Secretary proposed to the commodore to take charge, with the title of "Governor," as adding dignity to the position. His appointment was dated August 1, 1838, and he remained until 1842, when he was relieved upon his own application. During his service the classes of midshipmen preparing for examination were placed at the asylum, with one or two professors to instruct them,—a partial fulfillment of Mr. Paul Hamilton's idea. They at first had the basement rooms at the north end, which were truly reported as being "damp, cold, cheerless, and unhealthy." Afterwards, through the energetic remonstrances of Lieutenant Foote, they were placed on the floor above. Here they remained until the Naval Academy at Annapolis was founded, in 1845.

About 1842, during the administration of Secretary Upshur, a division of the building into two parts was effected by a lath-and-plaster partition, one part being hospital and the other asylum. The partition ran through the centre of the hall, and the wings being precisely alike, afforded equal conveniences. This arrangement did not continue long, however.

During the late war the necessity for a separate naval hospital became evident, and a large and commodious building for that purpose was erected upon a portion of the grounds nearer the river.

During the early years of the asylum those who died there were buried to the north of the asylum, but the cutting of a street led to the bodies being removed to ground to the west. When the hospital was built it was found necessary to remove the bodies again, and they were transferred to a lot belonging to the government in Mount Moriah Cemetery, where all interments now take place.

At the Naval Asylum hundreds of old men who have deserved well of their country have passed their declining years in tranquillity and comfort, not unfrequently attaining a great age. The present number of beneficiaries ranges from 130 to 150, and they die about as fast as new ones come in. Under the regulations no one is eligible for the asylum who has not passed at least twenty years in the naval service, but exceptions are made in cases of serious disability in the line of duty.

Upon entering the asylum a beneficiary has to give up to the hospital fund any pension of which he may be in receipt. Each one has a separate room, and is furnished with three wholesome meals a day, a good allowance of clothing, free washing, and one dollar and one pound and a half of tobacco per month.

There is a good library for the use of the inmates, and pleasant reading- and smoking-rooms, with open fires, and tables covered with newspapers and periodicals. No restraint is placed upon their movements, within reasonable hours, so long as their conduct is marked with propriety, and the usual punishment for misconduct is confinement to the grounds for a few days.—*E. Shippen.*

Asymtote. A line which continually approaches a curve but never meets it.

Atabal. A Moorish drum.

Atagan. See YATAGAN.

A-taunt-o, or All A-taunt-o. Every mast an-end and fully rigged.

Ategar. An old English hand-dart.

Atherine. A silvery fish used in the manufacture of artificial pearls. It is also called *argentine.*

Athwart. Transversely; at right angles to the keel; across the line of the ship's course.

ATHWART HAWSE. A vessel, boat, or floating timber drifted across the stem.

ATHWART-SHIPS. From side to side; in opposition to fore-and-aft.

ATHWART THE TIDE. Across the tide.

Atlantic. The ocean which separates the New World from Europe and Africa, so named from the Atlas Mountains, in Africa. See OCEANS.

Atlantides. The daughter of Atlas; a name of the Pleiades.

Atlas. A book of maps or charts, so called from the character of that name in ancient mythology, represented as carrying the world on his back. The name was first applied to maps by Mercator, the famous geographer, in the 16th century.

Atmosphere is the name applied to the gaseous fluid which surrounds the earth. It exhibits, in common with all fluid bodies, the usual characteristics of hydrostatic pressure, but its internal condition differs from that of a liquid, inasmuch as its particles repel each other, and can only be held in proximity by external force. From this circumstance it follows that the volume of any portion of air varies much more under the influence of external pressure than that of an equal volume of water; hence the stratum of air nearest the earth is denser than strata in the upper regions, where, from their being subjected to the weight of a smaller mass of superincumbent air, the repulsive force of the particles has freer play.

Chemical Composition of the Atmosphere.

	Volumes.	Grains.
Nitrogen	79.02	76.84
Oxygen	20.94	23.10
Carbonic acid	0.04	0.06
	100.00	100.00

Besides the substances just named other gaseous matters occur, but in quantities so small as not sensibly to increase the bulk of the atmosphere.

Posidonius first calculated the height of the atmosphere, stating it to be 800 stadia, nearly agreeing with our modern ideas, about 79 B.C. Its weight was determined by Galileo and Torricelli, about 1643; its density and elasticity by Boyle; and its relation to light and sound by Hooke, Newton, and Derham. The composition of the atmosphere was ascertained by Hales, Black, Priestley, Scheele, Lavoisier, and Cavendish; and its laws of refraction were investigated by Dr. Bradley, 1737.

Atolls. An East Indian name for the coral formations known as lagoon-islands.

Atomizer. An instrument to reduce a liquid to a spray.

Atrie. To bring-to in a gale.

A-trip. The anchor is *a-trip* when it is just hove clear of the ground. Sails are *a-trip* when they are sheeted home, hoisted taut up, and ready for trimming. Yards are *a-trip* when they are hoisted up and ready to be swayed across. A mast is *a-trip* when the fid is out ready for lowering.

Attached. Belonging to. An officer is said to be attached to any ship or station to which he is ordered for duty.

Attack. To fall upon with hostile intent; to assail.

Atterage. (*Fr.*) A land-fall.

Attested. Legally certified.

Attile. An old law term for the furniture of a ship.

Attraction. The principle by which bodies mutually tend toward each other, distinguished into the attraction of *gravitation*, of *cohesion*, and *capillary*, *magnetic*, and *electrical* attraction.

Atween, or 'Tween. Between.

Atwixt, or 'Twixt. Betwixt.

Auckland. A town of New Zealand, on the Waitamata Inlet. Lat. 36° 50′ S.; lon. 174° 50′ E. It has two fine harbors. Auckland is the third port in the colony in the value of exports and imports. Pop. 12,000.

Audit. To settle or adjust an account.

Auditor, Fourth. Chief of a bureau of the Treasury Department, established in 1817. Previously an accounting clerk in the Navy Department. The Auditor's office receives the accounts of all paymasters of United States vessels, navy-yards, and navy pay offices, of navy pension agents, paymasters, and quartermasters of the marine corps, and other disbursing agents for the Navy Department, and passes upon the correctness and legality of their receipts and expenditures. All claims for pay, bounty, prize-money, traveling expenses, or other compensation for services in the navy and marine corps should be made to this office. All allowances by the Fourth Auditor are subject to revision by the Second Comptroller. An appeal may be taken to the Comptroller from an adverse decision of the Auditor, and the decision of the former is final, except with Congress and the United States courts. The Auditor is the custodian of all pay- and muster-rolls of officers, men, and mechanics on board ship or at navy-yards, from which the state of their accounts can be readily ascertained. He also preserves all vouchers for expenditures of money and stores; the papers in claims of all characters; and the original or copies of all letters received or written. Records are kept of all accounts rendered to the office, and the amounts allowed and disallowed thereon; of all claims received, and the disposition thereof; of all moneys drawn from or refunded to the Treasury by navy disbursing officers; of all transfers of money, clothing, and small-stores between pay officers; of the amount of money appropriated for each specific naval purpose and the expenditures therefrom; of prizes captured, the participants in the capture, and the amounts distributed to claimants, and remaining unclaimed; of all allotments of pay, amount paid to each allottee, and amount deducted from the pay of each allottee; and other records of the transactions of the office. It is the duty of the Auditor to prepare the accounts of delinquent pay officers for suit on their official bonds, and transmit the same to the Solicitor of the Treasury. The Auditor has no power to compromise claims of the United States against its debtors. The office consists of the Auditor, Deputy Auditor, and about 40 clerks, and is organized in divisions, as follows: paymasters' accounts, prize-money, general claims, navy pay accounts, bookkeeper's, records, and navy pensions.

Auges. Apsides.

Auget. A tube filled with powder for firing a mine.

Augmentation of the Moon's Diameter. The increase in apparent diameter, due to an increase of elevation.

Auk. A sea-bird of the *Alca* family.

Aulin. An Arctic gull (*Cataractes parasiticus*). It is called *dirty aulin* by the northern boatmen.

Aumbrey. An old term for a bread and cheese locker.

Aume. A Dutch measure for wine, containing 40 English gallons.

Auriga. A northern constellation, popularly known as the "Wagoner." *a Aurigæ*, Capella.

Aurora. The goddess of morning. The faint light which precedes the rising of the sun.

Aurora Borealis. The northern lights. A luminous meteoric phenomenon, supposed to be

of electrical origin. This species of light usually appears in streams, ascending toward the zenith from a dusky bank, a few degrees above the northern horizon. Sometimes it assumes a wavy appearance, and is then called the *merry-dancers*. The streams assume a variety of colors, from pale yellow to blood-red.

AURORA AUSTRALIS. The southern lights.

Auster. The south wind of the ancients.

Austral. Relating to the south.

Australia. See CONTINENTS.

Austral Signs. The last six of the zodiac.

Austrian Navy. The geographical position of this immense empire renders it next to impossible that it should either possess or require a large navy. When the territory extended over Lombardo-Venetia, the ports of Venice and Trieste were commanded by Austria, and the trade there carried on needed the protection of ships of war. But that extensive portion of the empire which was assigned to Austria by the treaty of Vienna, in the year 1815, was wrested from her in the year 1859, when France united with Sardinia to achieve the independence and unification of Italy under one monarch. Consequently her maritime possessions have dwindled to the Danube and the ports in Dalmatia, etc., and as the former has but one outlet to the Black Sea, which does not admit of vessels drawing many feet of water, Austria needs not many ships of war to protect her commerce. At the present moment, therefore, she possesses but 47 steamers and 17 ships of war, and as their united burden is only 93,270 tons, and they altogether mount no more than 365 guns, it may be conceived that they are for the greater part very small vessels. The entire annual cost of the navy and the establishments connected with it is rather above ten millions of florins. The trade which the navy shelters is limited to 35 ports in the Littoral provinces, 54 in Dalmatia, and 11 in Croatia.

Autan. Gusts of wind from the south

Automatic Fire. An explosive mixture of the Greeks, compounded of equal parts of sulphur, saltpetre, and sulphide of antimony finely pulverized and mixed into a paste with equal parts of the juice of black sycamore and liquid asphaltum, a little quicklime being added. The rays of the sun would set it on fire.

Autumn. The fall: the months of September, October, and November.

AUTUMNAL EQUINOX. The time when the sun crosses the equator, moving south.

AUTUMNAL POINT. That point on the ecliptic whence the sun descends southward.

AUTUMNAL SIGNS. Libra, Scorpio, and Sagittarius.

Auxiliary Screw. A screw with which a full-rigged vessel is sometimes supplied, to be used in calms, working to windward, entering port, etc.

Avast. Stop; cease. From the Italian *basta*.

Avenue. The inlet into a port.

Average. A rule was established by the Rhodian law, and has prevailed in every maritime nation, that where a loss has been sustained or an expense incurred, for the general safety of the ship and cargo, a contribution should be made, in proportion to their respective interests, by the owners of the ship, freight, and goods on board; or, in modern times, by the insurer of these. To this contribution the name of *general average* is given. Personal property of the passengers, not carried for the purpose of traffic, is not liable for any share in this contribution. See JETTISON.

PARTICULAR AVERAGE. The loss of an anchor, the leakage of a cask, the washing overboard of goods, etc., where the common safety was not in question, and where there is, consequently, no contribution.

PETTY AVERAGES are pilotage, anchorage duty, etc. If these occur in the ordinary course of the voyage they are not loss, but simply a part of the expenses necessarily incurred. But if they have occurred under extraordinary circumstances, and for the purpose of avoiding immediate danger, they are a loss, which is included in the *general average*, and covered by the contribution.

AVERAGE BOND is a deed which parties liable to a general average are in the habit of executing, by which they empower an arbiter to value the property lost, and fix the proportion which shall be borne by each proprietor.

AVERAGE ADJUSTER. A qualified person to adjust the loss, damage, and expense in consequence of an accident or misfortune.

AVERAGE AGREEMENT. A written document signed by the consignees of a cargo, binding themselves to pay a certain proportion of general average that may arise against them.

Avviso. An Italian advice-boat.

Awaft, or Awheft. The displaying of a stopped flag.

Await, Lying in. In ambush for the purpose of cutting off passing vessels.

Award. A judgment by arbitrators in maritime cases.

A-wash. At the surface of the water.

Away Off. At a distance, but in sight.

AWAY SHE GOES! The cry when a vessel starts on the ways in launching. An order to walk away briskly with a tackle.

AWAY THERE! The call for a boat's crew to man their boat; as, *away there, launches!*

AWAY WITH IT! An order to walk away briskly with a tackle.

A-weather. The position of the helm when the tiller is borne over to the weather side. When it is put over to the extreme limit it is *hard a-weather*.

Aweigh. The position of the anchor just after breaking ground.

Awkward Squad. A squad of raw recruits, or of men detailed for extra drill on account of their stupidity.

Awning. A canvas covering spread over the deck of a vessel to protect the crew from the sun and weather. The *forecastle* awning extends from the foremast forward. The *main-deck* awning is spread between the foremast and the mainmast. The *quarter-deck* awning is spread between the main- and mizzen-masts, and the *poop* awning extends from the mizzen-mast aft.

The *back-bone* is a rope stitched to the middle of the awning. It runs fore-and-aft, has a thimble in one end, and to the other is hooked the *fore-and-aft* tackle. The awning is hauled out at the corners by *earings*, and at the sides by *stops* and *bull-earings*.

The *ridge-rope* is a rope fore-and-aft the ship on both sides, forming a straight line from stem to stern, and is supported by the rigging and by wooden or iron supports called *stanchions*.

The *shark's-mouth* is an opening to accommodate the masts and stays abaft, and the *dog's-ear* is one of the irregularly-shaped corners thus formed. The *euphroe* is a block of wood through which is rove a combination of small lines called a *crowfoot*. To this is hooked the *crowfoot-halliards*.

The *lacing* is the line which draws together the ends of adjoining awnings.

AWNING- or SIDE-CURTAINS are strips of canvas set between the ridge-rope and the rail.

To GET THE AWNING ON A STRETCH. To haul it taut between the masts.

To SPREAD AN AWNING. To suspend it parallel with the deck by means of the fore-and-aft tackle, earings, and side-stops.

To HOUSE AN AWNING. To bring the edges close down to a *housing-line* near the deck, thus giving the canvas a greater angle and causing it to shed the water.

To TRICE UP AN AWNING. To hook whips to the earings and edges and hoist it up to dry. The whips are sometimes hooked to the backbone.

To FURL AN AWNING. To roll it up and pass stops around it.

Ax. A tool for chopping wood.

BROAD-AX, a carpenter's tool. It has a wider and thinner blade and a shorter handle than the ordinary ax.

BATTLE-AX. The ancient weapon had, sometimes, a double edge. The tool by this name now in use is simply a hatchet.

Axis. A straight line passing through a body upon which it revolves, or may be supposed to revolve.

AXIS OF THE EARTH. That diameter upon which the earth rotates diurnally from west to east. In consequence of this rotation the earth has assumed its present form,—an oblate spheroid, being compressed at the extremities of the axis (the poles), and bulging in the regions most remote from them (the equatorial). With reference to its extremities, the axis is called the "*Polar Diameter.*"

AXIS OF THE HEAVENS. That diameter about which the celestial concave appears to revolve diurnally from east to west. It passes through the observer's place, and is parallel to the axis of the earth, with which it is generally considered coincident.

Axle. The cross-piece of a gun-carriage, on the extremities of which the trucks revolve, which extremities are called the *arms* of the axle.

Aye. Yes. *Aye-aye*, the response of commissioned officers, not commanding or flag-officers, to the hail of the sentry. *Aye-aye, sir*, the usual response to denote that an order is understood and will be obeyed.

Aylet. The sea-swallow.

Ayont. Beyond.

Ayr. An open sea-beach. A bank of sand. The mediæval term for oar.

Ayt. See EYGHT.

Azimuth. The arc of the horizon intercepted between the meridian of the place and a vertical circle passing through the centre of any body. The *magnetic* azimuth is the arc of the horizon intercepted between the vertical circle and the magnetic meridian. The difference between the *true* and the *magnetic* azimuth is the *variation* of the compass.

AZIMUTH CIRCLE, a vertical circle, or great circle passing through the zenith and nadir.

AZIMUTH AND ALTITUDE. The horizon co-ordinates for defining points of the celestial concave in its diurnal revolution relatively to the position of an observer on the earth's surface.

AZIMUTH AND ALTITUDE INSTRUMENT. An instrument for taking azimuths and altitudes simultaneously. The telescope by which the observations are made is capable of motion in two planes at right angles to each other, and the amount of its angular motion in each is measured in two circles co-ordinate to each other, whose planes are parallel to those in which the telescope moves. In the azimuth and altitude instrument one of these planes is horizontal, the other vertical.

AZIMUTH, MOTION IN. An instrument is said to move "in azimuth" when it is turned on a vertical axis; in contradistinction, it is said to move "in altitude" when it is turned on a horizontal axis. An azimuth and altitude instrument admits of both motions.

AZIMUTH COMPASS. A compass specially adapted for observing bearings.

AZIMUTH DIAGRAM, GODFRAY'S. A diagram by means of which the true azimuth can be rapidly and simply obtained without calculation, the data being the *latitude*, the *sun's declination*, and the *apparent time*. The scale on which it is constructed gives the result to within one-eighth of a degree.

Azogue. Quicksilver. A Spanish ship fitted expressly to carry quicksilver.

Azumbal. A Spanish wine measure, eight of which make an arroba.

B.

B. Abbreviation for *before* in the U. S. General Service Code of Signals. In the log *b* denotes *blue sky*.

Baard. A mediæval transport.

Baas. A Dutch skipper.

Babbing. A method of catching crabs.

Babbitt Metal. A soft alloy of copper, zinc, and tin, used for the bearing of journals to diminish friction.

Bac. A French ferry-boat. A punt used by shipwrights for carrying tar, pitch, etc.

A broad flat boat for transporting carriages, cattle, etc., over streams by means of a rope stretched across.

Bacallao *(Sp.)*. Newfoundland and adjacent islands. The name is also applied to the codfish salted in Newfoundland.

Bache, Alexander Dallas, LL.D., A.A.S., physicist, born Philadelphia, Pa., July 19, 1806; died Newport, R. I., February 17, 1867. West Point, 1825. He was a great-grandson of Dr. Franklin, and his mother was the daughter of A. J. Dallas. He was a lieutenant of engineers until his resignation, in 1829. Engaged in constructing Fort Adams and other works at the entrance of Narragansett Bay. From 1827 to 1832 he was professor of mathematics in the University of Pennsylvania, and then took charge of the organization of Girard College, spending some time, in 1836, inspecting the great schools of Europe, publishing, upon his return, a valuable report on the subject. In 1839 he resigned his connection with this college, and became, in 1841, principal of the Philadelphia High School. In 1843 he was appointed superintendent of the U. S. Coast Survey. Its valuable contributions to geodetic and physical science are found in the annual reports of the survey, and in the proceedings of the Association for the Advancement of Science. He was one of the founders of the American Association for the Promotion of Science, took a prominent part in founding the American Academy of Science, was made president of the American Philosophical Society in 1855, and was an active and efficient member of the United States Sanitary Commission throughout the war of the Rebellion. The degree of LL.D. was conferred on him by the University of New York in 1836, by the University of Pennsylvania in 1837, and by Harvard University in 1851. He was made a regent of the Smithsonian Institution in August, 1846. In 1833 he edited Brewster's "Optics," with notes. He published "Observations" at the observatory of Girard College, 1840–45, 3 vols. 8vo, "Report of Experiments to Navigate the Chesapeake and Delaware Canal by Steam," Philadelphia, 1834, and contributed many valuable papers to the scientific journals of the day.

Back, Sir George, born at Stockport, England, November 6, 1796. In the year 1819 this British naval officer accompanied Sir John Franklin on his first Arctic voyage. Fourteen years later he was sent out on an expedition in search of Captain Ross, an Arctic navigator, and published an interesting account of his voyage. In 1839 he was knighted, and in 1867 he became an admiral.

Back. The outside or convex part of compass-timber. The outermost board of a sawn tree.

Back of a Ship. A figurative term for the keel and kelson. See Broken-backed.

Back of the Post. An additional timber bolted to the after part of the stern-post.

To Back an Anchor. See Anchor.

To Back a Ship at Anchor. To keep the chain taut by hoisting the mizzen-topsail. If the wind falls she should be hove a-peak.

To Back a Sail. To lay the yard so that the wind acts on the forward surface, and thus check or stop the headway.

To Back Water. To row in a direction contrary to the usual mode, so as to give a boat sternway.

To Back the Port or Starboard Oars. To back on one side and give way on the other, so as to round quickly.

To Back a Rope or Chain. To put on a preventer.

To Back the Worming. To fill the holidays between the worming and the rope, so as to give a smooth surface for the service.

The wind is said *to back* when it changes direction against the sun.

To Back and Fill. A method of working to windward with a weather tide in a narrow channel. The main object is to keep the ship in mid-channel broadside on to the current. The yards are counterbraced, or the sails are kept shivering. The ship is kept well under control by bracing the yards and giving her the jib and spanker as circumstances demand. To attempt this manœuvre a correct knowledge of the strength and set of the currents and the depth of the water is required.

Back Her! The order to reverse the engine and give the vessel sternway.

Back-board. A board across the stern-sheets of a boat to form the coxswain's box, and also to support the backs of the passengers.

Back-bone. The fore-and-aft rope stitched to the midship part of an awning.

Backer. A broad piece of sennit nailed around the yard inside of the sheave. It is fitted with an eye or a thimble, and the head-earing is rove through it.

Back-frame. The vertical wheel which turns the whirlers of a rope-winch.

Backing. The timber behind the armor-plates of a ship. See Armor.

Back-lash. The reaction or striking back of the moving parts of machinery when the power is not uniform or the load is variable.

Back-o'-beyond. Said of a great unknown distance.

Back-observation. A name applied to an observation in which the greatest distance of the heavenly body from the horizon is measured. It is so called because the back of the observer is turned to the object when its altitude is taken.

Back-pressure. The resistance of the atmosphere or waste steam to the piston.

Back-rope. A rope which fits over the dolphin-striker with a cuckold's neck and sets up to the bows on each side. See GOB-LINE.

Back-sight. The breech-sight of fire-arms.

Back-staff. An old navigating instrument invented in 1590; so named because the back of the observer was turned to the heavenly body when its altitude was measured. See BACK-OBSERVATION.

Backstays. Ropes which extend from all mast-heads—except the lower—to the ship's side or channels.

STANDING BACKSTAYS set up well aft and support the masts when the wind is abaft the beam.

BREAST-BACKSTAYS set up in the channels and support the masts when on the wind. They are not now in use.

BEAR ABAFT THE BREAST-BACKSTAYS! An order to come up the breast-backstays and bear them abaft, in order that the yards may be braced sharp up.

PREVENTER-BACKSTAYS. Additional supports to assist the backstays when carrying on.

TRAVELING-BACKSTAYS are fitted with a traveler, which moves up and down with the topsail-yard. The support is thus kept where it is most needed. They are not now in use.

TO BACKSTAY A YARD. To brace it up as far as the backstays will permit.

Backstay-plates. Plates to which the backstays set up.

Backstay-stools. Small detached channels fixed abaft the principal ones, to which the standing backstays set up. They are introduced in preference to extending the channels.

Back-strapped. A ship with a wind fair, but so light as not to enable her to stem the current, is said to be *back-strapped.*

Back-sweep. That which forms the hollow of the top-timber of a frame.

Back-wash. See WASH.

Back-water. Water thrown back by the turning of a paddle-wheel or propeller. Water held by a dam or reservoir. The smooth water free from current in a small stream which runs into a large stream. It is caused by the rising of the water in the main stream.

Baculite. A genus of fossil shells of a straight form, a little conical, and in their cellular structure resembling the ammonites.

Badderlock. The *Fucus esculentus*, a kind of edible sea-weed.

Badge, Good-conduct. Any enlisted man holding a continuous-service certificate, who is distinguished for obedience and sobriety, and is proficient in seamanship and gunnery, shall receive, upon the expiration of his enlistment, a good-conduct badge; after he has received three such badges, under three consecutive re-enlistments, within three months from the dates of his discharge, he shall, if qualified, be enlisted as a petty officer, and hold a petty officer's rating during subsequent continuous re-enlistments; and shall not be reduced to a lower rating except by sentence of a court-martial.

Badge, Quarter. False quarter-galleries. A carved ornament on a vessel's quarter, containing a window or a representation of one.

Badger. To worry; to nag.

Badger-bag. The burlesque Neptune, who boards the ship on crossing the line.

Badger Whiskers. In 1841, Hon. George E. Badger, Secretary of the Navy, issued a general order regulating the uniform of the navy, in which was a clause requiring that no part of the beard should be worn long except the whiskers, and that they should not descend more than one inch below the tips of the ears, and thence in a line with the corners of the mouth. These were nicknamed "Badger Whiskers." Fashion, however, proved more powerful than the regulation, and the order was never fully enforced.

Baessy. The old name of a gun, afterwards called *base.*

Baffin, Wm., born in 1584. Engaged with Jas. Hall in Arctic investigations begun in 1612; this navigator discovered the gulf which communicates with the North Atlantic Ocean by Davis' Strait, and he earned immortality by giving the gulf the name of Baffin's Bay, in 1616; was killed at the siege of Ormuz, May 23, 1622.

Baffling. A light breeze, which is continually hauling and veering, is said to be *baffling.*

Bag. A pouch or sack to hold or convey anything. The bag in which the sailor's clothing is stowed is made of canvas painted black, with the owner's name and ship's number plainly stenciled thereon.

WHAT IS THE NUMBER OF YOUR BAG? Jack's facetious inquiry addressed to a comrade starting out on perilous duty from which he may never return. The saying originated from the habit seamen formerly had of going through a dead comrade's bag before his effects could be sold at auction.

DITTY-BAG. A small bag to hold sewing-gear, shaving-tackle, etc.

MONK-BAG. A small purse, which sailors wear strung around their neck, to contain their valuables. So named from the habit monkeys have of stowing away food in their cheeks.

BAG AND BAGGAGE. The whole movable property.

BAG OF THE HEAD-RAILS. The lowest part or sweep of the head-rails.

TO BAG ON A BOWLINE. To be leewardly. A sail is said *to bag* when, the leeches being taut, there is a great deal of slack canvas in the sail. Formerly sails were so cut intentionally, the idea being that they would catch more wind. Sails are now cut so as to set as flat as possible.

Bagala. A two-masted Arab boat, used both for commerce and for piracy. They are from 50 to 300 tons burden, and sail with great rapidity.

Baggety. The lump or sea-owl (*Cyclopterus lumpus*).

Baggonet. An old term for bayonet, and not a vulgarism.

Baghela. A Muscat one-masted vessel, 200 to 300 tons burden.

Bag-net. A fishing-net shaped like a bag.

Bagnio. A barrack for galley-slaves and convicts.

Bagpipe. To bagpipe the mizzen is to lay it

aback by bringing the sheet to the mizzen rigging.

Bag-reef. The lower reef of fore-and-aft sails; the upper reef of topsails.

Bagrel. A minnow or baggie.

Baguio. A rare but very violent wind among the Philippine Islands.

Bahar. A weight used in the East Indies, varying considerably in different localities, ranging from 223 to 625 pounds.

Bahia. A city and seaport of Brazil, situated in an elevated position on the strip of land forming the E. side of the entrance to All-Saints Bay, immediately within Cape San Antonio, on which is a revolving light 140 feet above sea-level; in lat. 13° 0′ 42″ S., lon. 38° 31′ 42″ W. It is 800 miles N.N.E. of Rio de Janeiro.

The harbor is one of the best in America, and is suitable for vessels of any size. The commerce consists chiefly in the export of sugar, cotton, tobacco, coffee, etc. The whale-fisheries of this city were once the greatest in the world, and large numbers of whales are still caught in the neighboring waters. Pop. 140,000.

Baidar. An Arctic canoe used for pursuing otters and even whales. It consists of a frame 18 to 25 feet long, covered with hides, and is impelled by 6 to 12 paddles.

Baikie. A name for the *Larus marinus*, or black-backed gull.

Bail. A surety. The cargo of a captured or detained vessel is not allowed to be taken on bail before adjudication except by mutual consent. To lade water out of a ship or boat with buckets (which were of old called *bayles*), cans, or the like.

Bail-bond. The obligation entered into by sureties. In prize matters the bail-bond is not a mere personal security given to the individual captors, but an assurance to abide by the adjudication of the court.

Bailey, Theodorus, Rear-Admiral U.S.N. Born in New York, and appointed midshipman from that State, January 1, 1818. Commissioned as lieutenant, March 3, 1827; receiving-ship, at New York, 1829; sloop "Vincennes," Pacific Squadron, 1834–36; special duty, 1837; navy-yard, New York, 1840; frigate "Constellation," East India Squadron, 1843; rendezvous, New York, 1846; commanding store-ship "Lexington," 1847–48. While in command of the store-ship "Lexington," during the Mexican war, rendered efficient and valuable aid to the commander of the Pacific Squadron by his energy, enterprise, and gallantry in fitting out and leading numerous expeditions against the enemy.

Commissioned as commander, March 6, 1849; commissioned as captain, December 15, 1855; commanding sloop-of-war "St. Mary's," 1856–57; commanded frigate "Colorado," Western Gulf Blockading Squadron, 1861–62.

Captain Bailey was Farragut's second in command in the battle at New Orleans, and led the attack and passage of the forts. He was officially commended by Admiral Farragut for his bravery and ability, and further complimented by being sent to Washington as the bearer of dispatches, announcing the victory. Commissioned as commodore, July 16, 1862.

Commodore Bailey, although his health was seriously impaired, asked for active duty, and in the fall of 1862 was ordered to command the Eastern Gulf Blockading Squadron, where he displayed great energy and perseverance in his successful attempt to break up blockade-running on the Florida coast. Commandant Portsmouth navy-yard, 1865–67.

Commissioned as rear-admiral, July 25, 1866. On special duty at Washington, D. C., 1867–70. Died 1876.

Bails. The frame which supports the canopy spread over the stern-sheets of a boat.

Bainbridge, William, Commodore U.S.N. Born in Princeton, N. J., May 7, 1774; was the son of Dr. Absalom Bainbridge, a leading physician of New York. His maternal grandfather was John Taylor, Lord High Commissioner of New Jersey under the crown. Bainbridge made his first cruise in the frigate "Alliance," then sold out of the navy and engaged in the India trade. When 18, he sailed as first mate of a vessel, and when 19, was made her commander. Appointed a lieutenant-commandant in the navy in 1798, and given command of the "Retaliation," 14. Captured off Guadaloupe by the French frigates "Insurgente" and "Le Volontier." Promoted to master commandant and given command of the "Norfolk," 18. Captured several French privateers. Promoted to captain in 1800, when 26 years old. Took the "George Washington," 28, to Constantinople with tribute-money from the Dey of Algiers, and was the first to show our flag in Turkey. Commanded next the "Essex," 32, in the Mediterranean. Next took command of the "Philadelphia," 38, joining the squadron of Commodore Preble. Captured the Moorish pirate "Meshboha," 22. While blockading Tripoli harbor, October 31, 1803, the "Philadelphia" grounded on a reef not laid down in the chart, and the vessel was captured by the Tripolitans, her commander, officers, and crew suffering imprisonment until the end of the Tripolitan war,—June, 1805. Made several cruises in the merchant service during the peace that followed. In December, 1808, hoisted his broad-pennant in the "President," 44, remaining in her until May, 1810. Sailed again in the merchant service until 1812, when war with England became imminent. It was the temper of the government to lay up our navy during this war, but by the earnest protest of Bainbridge and Stewart this terrible blunder was avoided. Commanded the Charlestown navy-yard until the declaration of war,—June 18, 1812. He relieved Hull in command of the "Constitution," 44, September 15, 1812. Ran down the coast of Brazil, and when in lat. 13° 6′ S. and lon. 31° W., she fell in with and captured the English frigate "Java," 38. The "Constitution" went into action and came out with royal yards across, and without losing a spar. The "Java" was reduced to a mastless wreck, too much injured to be taken into port. The "Constitution" had 9 killed and 25 wounded. Bainbridge was seriously shot with a musket-ball, and hurt by a splinter from the wheel. The "Java" had 124 killed and wounded. Her captain—Lambert—was fatally injured. Among the prisoners taken was Lieutenant-General Hislop, bound to Bombay as governor. Men and officers were released on parole at San Salvador. Reached Boston February 27, 1813, Bainbridge relinquishing her command. For this action he received a gold medal from Congress. Com-

manded the Charlestown navy-yard until the end of the war. Commanded the Mediterranean Squadron in 1815, his flag-ship being the "Independence," 74, and again in 1819, his flag-ship in this instance being the "Columbus," 80. Returned home in 1821, and was made a navy commissioner. Commanded the Philadelphia navy-yard. Died in Philadelphia, July 28, 1833, aged 59 years and 3 months. He married Susan Heyliger, granddaughter of Captain-General Heyliger, governor of the Dutch West Indies. His youngest daughter married Rear-Admiral Henry Kuhn Hoff, of the navy, and his grandson, William Bainbridge Hoff, is still in the service.—*Wm. Bainbridge Hoff, Lieutenant-Commander U.S.N.*

Bait. The charge of a hook to allure fish.

Baitland. An old word used to signify a port where refreshments could be procured.

Bala-chong. A kind of cake formed of small fishes pounded up with salt and spices and then dried. It is much esteemed in China as a condiment for rice, etc.

Balæna. The zoölogical name for the right whale.

Balaklava. A town of Russia, in the Crimea, on the Black Sea. Lat. 44° 29′ N.; lon. 33° 34′ 40″ E. It has an excellent port. Pop. 742.

Balance. To contract a sail into a narrower compass;—this is peculiar to the mizzen of a ship, and to the mainsail of those vessels wherein it is extended by a boom. The operation of balancing the mizzen is performed by lowering the yard or gaff a little, then rolling up a small portion of the sail at the peak or upper corner, and lashing it about one-fifth down towards the mast. A boom mainsail is balanced by rolling up a portion of the clew, or lower aftermost corner, and fastening it strongly to the boom.

Balance-fish. The hammer-headed shark (which see).

Balance-frames. Those frames or bends of timber, of an equal capacity or area, which are equally distant from the ship's centre of gravity.

Balance of Power. An expression used in diplomacy for that state of matters in which no one of the European states is permitted to have such a preponderance as to endanger the independence of the others.

Balance of Trade. The term commonly used to express the difference between the value of the exports from, and the imports into, a country. The balance is said to be favorable when the value of the exports exceeds that of the imports, and unfavorable when the value of the imports exceeds that of the exports.

Balance-reef. To *balance-reef* a sail is to reduce it to its last reef, generally applied to fore-and-aft sails.

Balance-reef-band. A reef-band that crosses a spanker or trysail from the head-earing to the tack diagonally, making it nearly triangular, and is used to contract it in very blowing weather. A balance-reef-band is generally placed in all gaff-sails; the band runs from the throat to the clew, so that it may be reefed either way,—by lacing the foot or lower half; or by lacing the gaff dropped to the band: the latter is only done in the worst weather.

Balance, Steam. The ordinary safety-valve (which see).

Balancing-point. A familiar term for centre of gravity.

Balandra. A Spanish pleasure-boat. A lighter, a species of schooner.

Balanus. The acorn-shell. A sessile cirriped.

Balcar, or Balcor. See Balkar.

Balch, George B., Rear-Admiral U.S.N. Born in Tennessee, January 3, 1821. Appointed from Alabama, December 30, 1837; attached to sloop "Cyane," Pacific Squadron, 1840; Naval School, Philadelphia, 1843.

Promoted to passed midshipman, June 29, 1843; special duty, 1845; in war with Mexico, November 1, 1846, engaged in first attack on Alvarado by squadron under Commodore Connor; engaged in active operations from May, 1846, to surrender of Vera Cruz, March, 1847; in Mosquito Fleet, under Commodore Tatnall, covered the landing of the army under General Scott, March 9, 1847; at the time acting master of the "Falcon"; March, 1847, engaged in the joint bombardment of Vera Cruz with the army, and was present at the surrender of that city and the Castle of San Juan d'Ulloa to the military and naval forces; steamer "Princeton," Mediterranean Squadron, 1847–48; Naval Observatory, Washington, 1849–50.

Commissioned as lieutenant, August 16, 1850; sloop "Plymouth," Pacific Squadron, 1851–54; while in the "Plymouth," Lieutenant Balch, in command of the advance post at Shanghai, China, was wounded in the hip in a fight between the rebels and Imperialists; navy-yard, Washington, 1855–57; sloop "Jamestown," Home Squadron, 1857–58; sloop "St. Mary's," Pacific Squadron, 1858–59; frigate "Sabine," 1860; while in the "Sabine," fell in with the transport "Governor" and rescued nearly 400 marines, under Lieutenant-Colonel Reynolds, the transport sinking under the "Sabine's" stern, November 24, 1861; in command of steamer "Pocahontas," South Atlantic Squadron, 1861–62; volunteered for command of boats in taking possession of Tybee Island, December 26, 1861.

Commissioned as commander, July 16, 1862; engaged rebel battery at Stono, South Carolina; in August, 1862, ascended Black River the distance of seventy-five miles, and drove rebel battery from earth-works, and engaged rebel infantry on the bluffs; commanding steamer "Pawnee," South Atlantic Blockading Squadron, 1863–65; July 16, 1863, was attacked by two batteries, the rebels making a simultaneous attack on General Terry's forces. They were repulsed, and Commander Balch was informed by General Terry that he had saved his command. The "Pawnee" was struck forty-six times. On December 25, 1863, the "Marblehead" was opened on by rebel batteries; the "Pawnee" took an enfilading position in the Keowah River, and demoralized the enemy and caused him to retreat; afterward captured two rebel guns. While in command of the "Pawnee," Commander Balch engaged in the combined operations of the naval forces under Rear-Admiral Dahlgren, and the army under General Foster, in Stono River, South Carolina, from July 3 to 11, 1864, and particularly in the bombardment of Battery Pringle, on James Island, South Carolina. On February 9, 1865, having with him the "Sonoma" and "Daffodil," he ascended the Togoda Creek, North Edisto, South Carolina, and engaged three rebel

batteries of eleven or twelve guns, driving the rebels from their earth-works. The "Pawnee" was hit ten times, the "Sonoma" twice, and the "Daffodil" twice; navy-yard, Washington, 1866–68.

Commissioned as captain, July 25, 1866; commanding flag-ship "Albany," N. Atlantic Squadron, 1868–69; navigation duty, Washington, 1870–71; navy-yard, Washington, 1872.

Commissioned as commodore, August 13, 1872; Governor Naval Asylum, Philadelphia, 1873–76; member Light-House Board, 1877–78; promoted to rear-admiral, 1878; superintendent of Naval Academy, 1879–80.

Balcony. The projecting open galleries of old line-of-battle ships' sterns.

Baldrick. A leathern girdle or sword-belt. Also the zodiac.

Baldwin, Charles H., Commodore U.S.N. Born in New York, September 3, 1822. Appointed from New York, April 24, 1839; attached to frigate "Brandywine," Mediterranean Squadron, 1839–40; sloop "Fairfield," Mediterranean Squadron, 1840–43; sloop "Vandalia," 1843–44; Naval School, Philadelphia, 1844–45.

Promoted to passed midshipman, July 2, 1845; frigate "Congress," Pacific Squadron, 1845–49; war with Mexico; operations in the neighborhood of Mazatlan during the time that place was in possession of the United States naval forces, from November, 1847, to June, 1848; two engagements with the enemy.

Commissioned as lieutenant, November, 1853; resigned, February 28, 1854; re-entered the service as lieutenant, 1861; commanded steamer "Clifton" at the passage of Forts Jackson and St. Philip, and capture of New Orleans, also at first attack on Vicksburg, 1862.

Commissioned as commander, November 18, 1862; commanding steamer "Vanderbilt"; special service, 1863–64; ordnance duty, Mare Island navy-yard, California, 1864–67; fleet-captain, North Pacific Squadron, 1868–69.

Commissioned as captain, 1869; Inspector of Ordnance, Mare Island, California, 1869–71; commanding "Colorado," Asiatic Squadron, 1871–73; commanding naval rendezvous, San Francisco, 1873.

Commissioned as commodore, August 8, 1876; member Board of Examiners, 1876–79.

Bale. A pack or bundle.

BALE-GOODS. Goods or merchandise done up in bales.

Baleen. The scientific term for the whalebone of commerce, derived from *balœna*, a whale. It consists of a series of long horny plates growing from each side of the palate in place of teeth. These plates are 10 to 15 feet in length, and about a foot in width at the base.

Bale-fire. A beacon-fire.

Balenot. A porpoise or small whale, which frequents the river St. Lawrence.

Balestilha. The cross-staff of the early Portuguese navigators.

Balinger, or Balangha. A kind of small sloop or barge; small vessels of war, formerly without forecastles. A trading-boat of the Philippines and Moluccas.

Balistes. A genus of ganoid fishes, characterized by their solid coat of mail extending over the head as well as the body. Commonly called *trigger-fish.*

Balit. A one-masted vessel of Muscat, from 100 to 200 tons burden.

Balize is on the Bay of Honduras, at the mouth of the river Balize. Lat. 17° 29′ 18″ N.; lon. 88° 12′ W. The anchorage is safe and the harbor spacious. The chief trade is in mahogany. Exports and imports about $1,000,000 per annum. Pop. 4000.

Balk. Young trees felled and squared. A beam of timber used for temporary purposes, and under eight inches square. Timbers, squared, of any size, intended for planks, or, when very large, for booms or rafts.

Balkar. A man placed on an eminence to watch the movements of shoals of fish. In early statutes he is called *balcor.*

Ball. A round body or globe. A solid shot or bullet discharged from a cannon or other gun. Formerly the word ball in its military sense sufficiently described the projectiles of fire-arms, as nothing but round solid substances, such as stone, iron, or lead, were so employed. With the introduction of the mortar, however, which was probably not long after the invention of cannon, irregularly-shaped pieces of stone or metal came to be used, and at the siege of Naples by Charles VIII., in 1435, we first hear of shells or hollow shot being used. The word, therefore, as applied to the projectiles of fire-arms is not now inclusive of all the projectiles used, but only of a class. See BULLET, SHELL, SHOT.

Ball, with a prefix more or less descriptive of its purposes, such as fire-ball, stink-ball, etc. (for which see separate headings), denotes pyrotechnical compositions, or missiles filled with mal-odorous matter.

BALL AND SOCKET. A joint, of which the inner part is formed like a ball and the outer part is a hollow socket, inclosing the greater portion of the ball, and fitting close upon it, but allowing freedom of motion in every direction.

TO BALL OFF. To wind up into a ball; as, rope-yarns.

Ballahou. A fast-sailing schooner, common in Bermuda and the West Indies. The foremast rakes forward and the mainmast aft; hence the term ballahou is sometimes applied to men-of-war in which the masts are not kept properly stayed, or which are slovenly in other respects.

Ballarag. See BULLYRAG.

Ballast. A heavy substance employed to give a ship sufficient hold on the water to give her stability. The amount of ballast depends not only on the ship's size and cargo, but also on her build. It is not merely the *weight* of ballast which the mariner has to consider; he is required to take into account its *distribution. To ballast* a ship is the act of disposing the ballast so that the ship will maintain her proper equilibrium, and be neither too *stiff* nor too *crank.* If she be too stiff she will sail sluggishly, and her masts will be endangered by her violent rolling. If she be too *crank* she will be unable to carry sail without the danger of capsizing. Stiffness is occasioned by stowing the ballast well down, which brings the centre of gravity very near the keel. Crankness, on the other hand, is occasioned by raising the centre of gravity too high.

The object, therefore, is to so place the ballast, neither too high nor too low, neither too near the head nor too far aft, that the ship may be

brought down so that the surface of the water will be brought nearly to the extreme breadth amidships.

The cargo and ballast are considered together, the quantity and distribution of the latter being made dependent upon the former. In a man-of-war the ballast is permanent, and is made subservient to the guns and other top-weights she is required to carry. The substances used as ballast are various, chiefly iron, stone, gravel, sand, mud, and water.

A ship is said to be *in ballast* when she carries no weight except the ballast, crew, passengers, provisions for, and baggage of, crew and passengers.

To LOSE ONE'S BALLAST is to become top-heavy from conceit.

To HEAVE or SHOOT BALLAST is to dump mud or gravel ballast overboard. In order to prevent the filling up of harbors and channels certain regulations have been made at most maritime places for the disposal of ballast. The ballast is said to *shift* when from violent rolling it is removed from its original position.

BAG-WATER BALLAST is contained in water-proof bags laid upon the floor of a vessel, and filled or emptied by means of a pump and hose.

BOTTOM-WATER BALLAST is confined beneath a false bottom in the vessel.

HOLD-WATER BALLAST is contained in a large receptacle, which may be filled with cargo when the ship is not in ballast.

PIG-IRON BALLAST is supplied to men-of-war. It has the great advantage of taking up but little space.

SHINGLE BALLAST is composed of coarse gravel.

TANK-WATER BALLAST is contained in two fore-and-aft tanks, which can be easily filled and emptied by means of a pump.

Ballastage. A duty paid for taking up ballast from a port.

Ballast-basket. A basket made of osier for the measure and transport of ballast.

Ballast-lighter. A large flat-floored barge, for heaving up and carrying ballast.

Ballast-mark. The horizontal line described by the surface of the water on the body of a ship, when she is immersed with her usual weight of ballast on board.

Ballast-master. A person appointed to see the port-regulations in respect to ballast carried out.

Ballast-ports. Square holes cut in the sides of merchantmen for taking in ballast.

Ballast-trim. Trim when in ballast.

Ballatoon. A sort of long heavy luggage-vessel of upwards of a hundred tons, employed on the river between Moscow and the Caspian Sea.

Ball-cartridge. See CARTRIDGE.

Ball-clay. Stiff clay brought up by the flukes of the anchor.

Ballistic Pendulum. An instrument invented by Robins for measuring the force or velocity of cannon- and musket-balls. To one extremity of an iron bar was fixed a heavy cubical block of wood, lined at the back with iron. A transverse bar of iron at the other extremity of the first bar served as an axis of suspension, in which the pendulum swung freely, backwards and forwards. In order to measure the extent of the vibration which the pendulum made after receiving the impact of the projectile, a ribbon was attached to the lower end of the pendulum, passing loosely through an orifice in a horizontal bar in the frame-work; when the pendulum was raised it drew the ribbon along with it, and the quantity which thus passed through the orifice measured the chord of the arc of vibration. The instrument now used consists of a case or mortar of cast iron, partly filled with sand-bags or block-lead, suspended by wrought-iron bars from an axis working on knife-edges on V-supports, and the arc of vibration is measured on a copper arc by an index carrying a vernier. If such a pendulum, when at rest, be struck by a body of a known weight, and the vibration which the pendulum makes after the blow be known, the velocity of the striking body may thence be determined. The quantity of motion of the projectile before impact is equal to that of the pendulum and projectile after impact. See ELECTRO-BALLISTICS, GUN PENDULUM.

Ballistics. The art or science of throwing weapons by means of engines.

Balloen. A Siamese state-galley built to imitate a sea-monster, and pulling seventy to a hundred oars of a side.

Ballon. A brigantine-rigged vessel used in Siam, and made of a single tree.

Balloon. A bag of silk or other fabric filled with gas specifically lighter than the atmosphere, and hence deriving a tendency to ascend.

Balloon-fish. A fish of the genus *Diodon*, having the power of inflating its body until it becomes almost globular.

Balloon-jib. See JIB.

Ballot. To bound from side to side; as, a shot in the bore of a gun.

Ballow. Deep water inside a shoal or bar.

Bally. A Teutonic word for *inclosure*, now prefixed to many seaports in Ireland, as Ballycastle, Ballyhaven, etc.

Balsa (*Sp.*). 1. A pool; a lake. 2. A raft, or float, for conveying goods or persons across a river. It seems probable that the original signification of a pool or lake was converted into the means employed to cross lakes or rivers. On the west coast of South America balsas are made of bullocks' hides sewn together over a frame-work in two cylinders joined together, not unlike in form to the jaw-bone of a horse. Another kind of balsa is made of several pieces of an extremely light wood, sharpened at the ends and lashed together, with transverse slats to hold them singly in position. Both these means were employed centuries ago for landing in the surf. The same primitive arrangement of the second kind, using a sail, is the fishing-boat met far out of sight of land on the coast of Brazil. The general acceptation of the word on this continent is either two or more inflated bags of india-rubber, or long casks of metal or wood secured together in pairs, held some distance apart by a frame-work, or logs of light wood held together as before described, usually employed where the surf is heavy. 3. Any form of flotation capable of propulsion not designed for temporary use, differing from a raft in that the latter is a mere temporary expedient. See LIFE-BOATS and LIFE-RAFTS.—*Daniel Ammen, Rear-Admiral U.S.N.*

Baltheus Orionis. The three bright stars constituting Orion's Belt.

Baltimore, a city and port of entry of Maryland, is on the estuary of the Patapsco River, 12 miles from its entrance into Chesapeake Bay, and 250 miles by ship-channel from the sea. Lat. 39° 17′ N.; lon. 76° 37′ W. The harbor is spacious and secure. The facilities for the transfer of freight from the railways to the shipping are excellent, and in recent years the city has become one of the leading places of export in the United States. Steamship lines connect it with Liverpool, Bremen, and the principal domestic ports. Pop. 330,000.

Balusters. The ornamental pillars of the balconies or galleries of ships.

Bamba. A commercial shell of value on the Gold Coast of Africa.

Bamboo. A plant of the family of grasses, and genus *Bambusa*, growing in tropical countries. *Bamboo arundinacea* has a round, straight, hollow, woody, jointed stem; it grows to the height of forty feet and upward. Old stalks are five or six inches in diameter, and are so hard and durable that they are used in the manufacture of agricultural implements, and in building houses and ships. Bamboo is in general use in China for masts of junks, hence the pidgin-English expressions, "two piecee bamboo" and "three piecee bamboo" for brig-rigged and full-rigged vessels.

Bamboozle. To deceive; to play low tricks upon. To decoy the enemy by hoisting false colors.

Banana. A species of the genus *Musa* and its fruit.

Band. An iron hoop around a mast or yard. A company of musicians allowed to a ship or navy-yard. See Reef-band, Roband.

Bandsman. A member of the band.

Master of the Band. The leader of the band.

Bandage. A fillet, roller, or swath used in dressing wounds.

Bandala. The fibre from which the Manilla white rope is made. It is an outer layer of the abaca, a variety of the plantain. See Rope.

Bandaleer, or Bandoleer. A large leathern belt thrown over the right shoulder and dangling under the left arm, worn by ancient musketeers for sustaining their musket. A small leather case, of which every musketeer wore twelve, suspended by a belt.

Banded-drum. See Grunter.

Banderole. A small streamer or banner carried at the mast-head of a vessel, or at the end of a pike or lance.

Band-fish, or Ribbon-fish. A popular name of the *Gymnetrus* genus.

Bandle. An Irish measure of two feet.

Bang. An astringent and narcotic drug made from the large leaves and capsules of the wild hemp (*Cannabis Indica*). A mixture of opium, hemp-leaves, and tobacco, of an intoxicating quality, chewed and smoked by the Malays and other people in the East.

Bange. Light, fine rain.

Bangkok, capital of Siam, on the Menam, 20 miles from its mouth. Lat. 13° 38′ N.; lon. 100° 34′ E. Steamers ply hence to Singapore and Hong Kong. Value of exports in 1877, $8,200,000; of imports, $7,500,000. Vessels of 250 tons come up to the town. Pop. 500,000.

Bangles. The hoops of a spar. The rings on the wrists and ankles of Oriental people, chiefly worn by females.

Bangor. A city and port of entry in Maine, on the right bank of the Penobscot River, about 60 miles from the ocean. Lat. 44° 48′ N.; lon. 68° 47′ W. It is the head of navigation on the Penobscot River, which traverses extensive forests of pine, cedar, etc. The average quantity of lumber shipped annually from Bangor is about 200,000,000 feet. Pop. about 23,000.

Banian. A sailor's colored frock.

Banian-, or Banyan-days. A cant term among sailors to denote those days on which meat does not form a part of the ration. The term is derived from a religious sect in the East who never eat flesh.

Banian-, or Banyan-tree. The India fig-tree (*Ficus Indica*). The tendrils from the branches take root on reaching the ground, and form new stocks, till they cover a space of an acre or more. Religious rites, from which women are excluded, are there performed.

Banjo. The brass frame in which a screw-propeller is hung.

Bank. The border or margin of a river or lake. A shoal composed of sand, mud, or gravel. A seat or bench for rowers in a galley. The common galleys had 25 banks on each side, with one oar to each bank, and four men to each oar. The galeasses had 32 banks on a side, and six or seven rowers to each bank. See Galley.

To Double-bank an Oar is to set two men to pulling one oar.

A Single-banked Boat is one in which a thwart is occupied by one man.

A Double-banked Boat is one in which two rowers sit on the same thwart.

Banka. A canoe of the Philippines consisting of a single piece.

Banker. A vessel engaged in the cod-fishery on the banks of Newfoundland.

Bankerk, Joseph van Trappen. A Dutch admiral, born at Flushing about 1590; fought in the battle of Dunkirk, and defeated the Portuguese fleet near Brazil in 1647. Died on his voyage home the same year.

Bank Fires. To allow the fires in the furnace to burn down low, and then cut off the supply of oxygen by covering the fires with ashes and closing the doors of the furnace and ash-pit. By this means fuel will be saved, and in an emergency fires can be spread and steam generated with great rapidity.

Bank-harbor. A harbor protected from the violence of the sea by banks of sand, mud, or gravel.

Bankhead, John Pine, Captain U.S.N. Born in South Carolina, August 3, 1821. Entered as a midshipman August 6, 1838, became a passed midshipman in 1844, a lieutenant in 1852, a commander in 1862, and a captain in 1866. Died at Aden, Arabia, April 27, 1869. In command of the gunboat "Pembina," November 7, 1861, at the battle of Port Royal, and subsequent operations on the coast of South Carolina. In command of the original "Monitor" when she foundered off Cape Hatteras, December 31, 1863.

Bank-hook. A large fish-hook laid baited in running water with line attached to the bank.

Banking. A general term applied to fishing on the great bank of Newfoundland.

Banksal, or Banksaul, and in Calcutta spelled

bankshall. A shop, office, or other place, for transacting business. A square inclosure at the pearl-fishery. A beach store-house wherein ships deposit their rigging and furniture while undergoing repair. A place where small commercial courts and arbitrations are held.

Bannag. A name for a white trout; a sea-trout.

Bannak-fluke. A name of the turbot, as distinguished from the halibut.

Banner. A small square flag edged with fringe.

Bannerol. A little banner or streamer.

Bannock. A name given to a certain hard ship-biscuit.

Banstickle. A diminutive fish, called also the three-spined stickle-back (*Gasterosteus aculeatus*).

Baptism. A ceremony practiced on sailors and passengers on their first crossing the equator: a riotous and ludicrous custom, which from the violence of its ducking, shaving, and other practical jokes, is becoming annually less in vogue. It is esteemed a usurpation of privilege to baptize on crossing the tropics.

Bar. A boom formed of huge trees, or spars lashed together, moored transversely across a port, to prevent entrance or egress. The short bits of bar-iron, about half a pound each, used as the medium of traffic on the Negro coast. An accumulated shoal or bank of sand, shingle, gravel, or other uliginous substances, thrown up by the sea to the mouth of a river or harbor. The shore on which the deposition of sediment is taking place will be flat, whilst the opposite one is steep. It is along the side of the latter that the deepest channel of the river lies; and in the line of this channel, but without the points that form the mouth of the river, will be the *bar*. If both the shores are of the same nature, which seldom happens, the bar will lie opposite the middle of the channel. Rivers in general have what may be deemed a bar, although it may not rise high enough to impede the navigation,—for the increased deposition that takes place when the current slackens must necessarily form a bank. Bars of small rivers may be deepened by means of stockades to confine the river current, and prolong it beyond the natural points of the river's mouth; they operate to remove the place of deposition farther out, and into deeper water. Bars, however, act as breakwaters in most instances, and consequently secure smooth water within them. The deposit in all curvilinear or serpentine rivers will always be found at the point opposite to the curve into which the ebb strikes and rebounds, deepening the hollow and depositing on the tongue. Therefore if it be deemed advisable to change the position of a bar, it may in some cases be aided by works projected on the last curve seaward. By such means a parallel canal may be formed which will admit vessels under the cover of the bar.

Bar-harbor. One which from a bar at its entrance cannot admit ships of great draft, or can only do so at high water. *Bar-shallow*, a term sometimes applied to a portion of a bar which has less water on it than other parts of the bar.

Baracoota. A tropical fish (*Sphyræna baracuda*), considered in the West Indies to be dangerously poisonous at times, nevertheless eaten, and deemed the sea-salmon.

Barangay. An East Indian vessel propelled by oars.

Barbadoes Tar. A mineral pitch or petroleum, which flows from the earth or rocks in many places.

Barbalot. The barbel. Also, a puffin.

Barb-bolt. A *rag-bolt.* A bolt with a jagged end to make it hold when it cannot be clinched.

Barbel. A fresh-water fish found in many European rivers; its upper jaw is furnished with four beard-like appendages.

Barber. A singular vapor rising in streams from the surface of the water. The condensed breath on the beard and moustache. A rating on the ship's books for the man who shaves the people.

Barbette (*Fr.*). A mound on which guns are mounted to fire over the top of the parapet. Guns are *in barbette* when they are mounted so as to fire over a parapet, and not through an embrasure. *Barbette gun*, or *barbette battery*, a gun or battery mounted *in barbette*. *Barbette carriage*, a carriage which permits of its gun being mounted in barbette.

Barca (*Sp.*). A small two-masted vessel.

Barca-longa (*Sp.*). A large Spanish coasting vessel with pole-masts and lug-sails. The name is also applied to Spanish gunboats.

Barcarolle. A popular song sung by Venetian gondoliers.

Barcelona. A seaport town of Spain. Lat. (mole light) 41° 22′ 36″ N.; lon. 2° 11′ E. The port is commodious, two moles having been built for its improvement. Pop. 225,000.

Barces. Short guns with large bores, formerly used in ships.

Barchetta. A small bark for transporting provisions.

Barcon. A Mediterranean lighter.

Bareka. A small barrel, spelled also barika.

Bare poles. A vessel at sea is said to be under *bare poles* when no sail is set; in which case she may be either lying-to, or scudding before the gale.

Barge. A vessel or boat of state elegantly furnished. A double-decked passenger or freight boat having no power of its own, but towed by a steamboat. A long double-banked boat of spacious construction for the use of flag-officers. A spacious light-draft river-boat for the transportation of heavy merchandise.

Bargees. The crews of canal-boats and river-barges.

Barge-mate. The officer who steers a boat of state on occasions of ceremony.

Barge-men, or Barges. Picked men who pull the barges.

Barget. An old term for a small barge.

Bari. A city and seaport of Italy, on a peninsula in the Adriatic. Lat. 41° 7′ 52″ N.; lon. 16° 53′ 4″ E. The quay and roadstead are good, and the harbor has been much improved of late. Pop. 52,000.

Barilla. A sea-shore or maritime plant from which soda is made. In commerce this name is applied to the impure carbonate of soda made by burning certain maritime plants. See Algæ.

Bark, or Barque. Any small vessel. A three-masted vessel square-rigged on the fore and main, with fore-and-aft sails on the mizzen-mast. *Bark-rigged*, rigged as a bark, with no square-sails on the mizzen-mast.

Barkantine, or Barquantine. A three-masted vessel square-rigged on the fore-mast, and fore-and-aft rigged on the main- and mizzen-masts.

Barkers. An old term for lower deck guns and pistols.

Barkey. A sailor's term of endearment for the ship to which he belongs.

Barking-irons. Large dueling pistols.

Barling. An old term for the lamprey.

Barling-spars. Spars fit for any small mast or yard.

Barnacle (*Conch.*). A species of the *Balanidæ*, a family of sessile crustaceans. The shells are common along sea-shores, where they adhere to rocks, timber, and vessels. (*Ornith.*) A species of goose (*Anas lucopsis*) frequenting the northern seas in summer and migrating southwards in winter. Formerly the strange notion prevailed that they grew out of the barnacles attached to ships; hence the name.

Barnstable (Mass.). A port of entry on a bay of the same name, which is a part of Cape Cod Bay. Pop. about 430, mostly engaged in the coast-trade and fisheries.

Barometer (Gr. *baros*, weight, and *metron*, measure). An instrument for measuring the weight or pressure of the atmosphere. The discovery of the instrument resulted from an application, made to Galileo by workmen engaged in preparing a suction pump for a deep well, to know why, notwithstanding great care in forming and fitting the valves and piston, the water would not rise higher than about 32 English feet. In that age the doctrine of a *plenum* was an axiom in philosophy; and the ascent of water in the barrel of the pump was universally ascribed to nature's horror of a *vacuum;* Galileo therefore contented himself with replying that the power of nature to overcome a vacuum was limited, and did not exceed the pressure of a column of water 32 feet in height. Before his death, however, which happened soon after, in 1642, he earnestly recommended to his pupil Torricelli to undertake the investigation of the subject. Torricelli, suspecting the true cause of the suspension of the water, namely, the weight of the atmosphere, conceived the idea of trying the experiment with mercury. He perceived that if the weight of the atmosphere forms a counterpoise to a column of water of 32 feet, it must also counterpoise a column of mercury of about 28 inches in height, the weight of mercury being about 14 times greater than that of water. Having procured a glass tube of about 3 feet in length and a quarter of an inch in diameter, hermetically sealed at one end, he filled it with mercury; and covering the open end with the finger, he immersed it in an open vessel containing mercury. On bringing the tube to the vertical position, and removing the finger, the mercury instantly sank, leaving a vacuum at the top of the tube, and after making several oscillations, stood in the tube at the height of about 28 inches above the surface of that in the vessel. On covering the mercury in the vessel with a portion of water, and raising the tube till the lower end came into contact with the water, the mercury all ran out, and the water rushed up to the top of the tube. This experiment, called after its author, the *Torricellian experiment*, demonstrated that the mercury was sustained in the tube, and the water in the barrel of the pump, by exactly the same counterpoise, whatever the nature of it might be. Torricelli died shortly after without completing his discovery, but the fame of his experiment attracted to the subject the attention of philosophers in other countries; among others the celebrated Pascal. After various experiments, all of which tended to establish the pressure of the atmosphere, it occurred to Pascal that if the mercurial column was really supported by atmospheric pressure it must be affected by the weight of the superincumbent mass of air, and consequently be diminished at considerable elevations. Assisted by his brother-in-law, Perier, he conclusively established by experiments the correctness of the theory, and thereupon proposed the barometer as an instrument for measuring the height of mountains, or the relative altitudes of places above the surface of the earth. While Pascal, therefore, is justly credited with the practical demonstration of the value of the barometer in the determination of heights, it is claimed that Claudio Beriguardi, at Pisa, had made the same application of the instrument five years before; and it appears that Alhazen, the Saracen, A.D. 1100, was aware that the atmosphere decreases in density with increase of height.

The barometer in its ordinary form consists of a tube 34 inches in length, closed at the top, exhausted of air, and with its lower end immersed in a cup of mercury, which the pressure of the atmosphere causes to ascend in the tube. The height of the mercurial column varies with changes in the weight of the atmosphere, and a graduated scale alongside the tube, embracing the range of oscillation, enables the variations to be noted.

In all barometric observations there are, in general, two essential corrections to be made: one for capillarity, or depression of the mercury in the tube, and the other for temperature. The following are the corrections for tubes of different diameters according to the theory of Mr. Ivory:

Diam. of tube. *Inches.*	Depression. *Inches.*	Diam. of tube. *Inches.*	Depression. *Inches.*
.10	.1403	.40	.0153
.15	.0863	.45	.0112
.20	.0581	.50	.0083
.25	.0407	.60	.0044
.30	.0292	.70	.0023
.35	.0211	.80	.0012

In siphon barometers (so called from their shape), having both branches of the same diameter, the depression is equal at both ends; consequently the effect is destroyed, and no correction is required. The correction for the temperature, which is the most important, depends on the expansion of the mercury and the expansion of the scale on which the divisions are marked; this latter expansion being very small, is disregarded. In order to ascertain the necessary correction for expansion of the mercury, a thermometer must be attached to the barometer and observed at the same time. The rule usually followed is to "subtract the ten-thousandth part of the observed altitude for every degree of Fahrenheit above 32°." Calculated correction tables are published.

The Aneroid Barometer (Gr. *a*, without, and *neros*, a fluid). In this instrument the varying pressure of the atmosphere is indicated, not by the varying height of a column of fluid, but by the compression and expansion of a small metal vessel from which nearly all the air has

been exhausted. Its external appearance is that of a circular brass box having a dial face, the graduations of which are pointed out by a finger, which is moved by machinery attached to the elastic nearly exhausted vessel fixed within. At the back of the instrument is a screw for the purpose of adjusting its indications by reference to the mercurial barometer. The aneroid requires to be thus originally set, and should be thus adjusted from time to time. It possesses the advantages of being very susceptible and portable, and is a most convenient "weather glass" for ship's use. It is also a convenient instrument for roughly estimating the heights of mountains.

For additional information respecting the barometer and its uses, see "Weather Guides," by Rear-Admiral Jenkins.

Barometer-gauge. An appendage to a boiler or condenser to indicate the state of the vacuum.

Barquantine. See BARKANTINE.

Barque. See BARK.

Barra-boats. Vessels of the western isles of Scotland, carrying ten or twelve men. They are extremely sharp fore and aft, having no floor, but with sides rising straight from the keel, so that a transverse section resembles the letter V. They are swift and safe, for in proportion as they heel to a breeze their bearings are increased.

Barrack-smack. A corruption of *Berwick-smack;* a word applied to small Scotch traders.

Barracoon. A slave warehouse, or an inclosure where slaves are kept.

Barrator. The master of a ship who commits any fraud in the management of the ship, or in relation to his duties as master, by which the owners or insurers are injured.

Barratry. A fraudulent breach of duty or willful act of known illegality on the part of a master of a ship, in his character as master, or of the mariners, to the injury of the owner of the ship or cargo, and without his consent, and it includes every breach of trust committed with dishonest views; as, by running away with a ship, by scuttling or deserting her, or by embezzling her cargo.

Barred Killifish. A fish from two to four inches in length, which frequents salt-water creeks, floats, and the vicinity of wharves.

Barrel. The cylinder between the whelps and the pawl-rim constituting the main piece of a capstan. The part of the wheel on which the tiller-ropes are wound. The tube of a fire-arm. The piston-chamber of a pump. A cylindrical wooden vessel or cask, greater in length than in breadth, bulging in the middle, and composed of staves and headings held together by hoops of wood or iron. A measure of capacity, as 31½ gallons of wine, 36 gallons of ale, or 196 pounds of flour.

BARREL-BUILDER. An old rating on the ship's books, now called *cooper.*

BARREL-BULK. A measure used in estimating capacity for freights. It is equal to five cubic feet, or one-eighth of a ton.

Barrel-screw. A powerful machine, consisting of two large poppets, or male screws, moved by levers in their heads upon a bank of plank, with a female screw at each end. It is of great use in starting a launch.

Barrier of Ice. Ice stretching from the land-ice to the sea- or main ice, or across a channel, so as to render it impassable.

Barrier Reefs. Coral reefs that either extend in straight lines in front of the shores of a continent or large island, or encircle smaller isles, in both cases being separated from the land by a channel of water. Barrier reefs exist in New South Wales, the Bermudas, Laccadives, Maldives, etc.

Barron, James, Commodore U.S.N. Born in Virginia in 1769. Went to sea early in life, and served with his father in the early marine of Virginia, commanding the "Patriot." Entered the navy as lieutenant, March 9, 1798, and cruised under Barry, in the "United States," in the West Indies, and afterwards to France. Promoted to captain, May 22, 1799, commanded the "President" (44) in Dale's squadron to Tripoli, and returned in Morris's squadron in the "New York" (36) in 1802. Transferred to the "Chesapeake" (38), and returned home in her. Again went to the Mediterranean, in the "Essex" (32), under the flag of his brother, S. Barron, and was transferred to the "President" (44) in 1805. Was sixth captain on the new navy list. Returning home in 1806, he was given the "Chesapeake" (44), and hoisted a broad-pennant on her in June, 1807. He put to sea June 22, and was followed out of Chesapeake Bay by the "Leopard" (50), an English frigate, and, while unprepared to fight, was fired into from that ship, after some parley concerning search, and compelled to surrender, having been wounded. He was tried on several charges, found guilty of two, and suspended from rank and pay for five years, until 1813. During the period of his suspension he was absent from the United States, and on his return became involved in a quarrel with Commodore Decatur, and killed that officer in a duel, March 22, 1820, himself being seriously wounded. Resided in Norfolk until 1825. Commanded Philadelphia navy-yard, 1825–27; Norfolk navy-yard, 1827–32; Philadelphia navy-yard, 1833–37; waiting orders, 1838–42. He became the senior officer of the navy in 1839. On leave and waiting orders until his death, which occurred at Norfolk in 1851, April 21, he being 82 years old, and having been in the navy 53 years.—*F. S. Bassett, Lieutenant U.S.N.*

Barry, John, Commodore U.S.N. Born in Wexford County, Ireland, in 1745. He went to sea in the merchant service while yet young. Arriving in America at the age of 15, he adopted it as his home. He received one of the first commissions in our navy. Commanded the "Lexington," brig (16), the first cruiser to sail, and captured the British tender "Edward." Was transferred to the frigate "Effingham" the same year, and commissioned captain, No. 7 on the list. Successfully removed the ships up the river when Philadelphia was taken, and captured a schooner by a bold dash with boats. Volunteered with the army, and was aid to General Cadwalader at Trenton. Appointed to command the "Raleigh" (32), and being chased by a British squadron, he made a brave defense, but ran his ship ashore and lost her.

Commanded several letters of marque in the West Indies. Sailed in February, 1781, in command of the "Alliance" (32), with our minister, Laurens, to France, and on his return in the same year, May 29, captured the English sloop "Atalanta" and brig "Trepassa," and was severely wounded.

Sailed again in 1781, conveying Lafayette and De Noailles to France. Left L'Orient February, 1782, and cruised in the Atlantic. Returning from Havana in March, he was chased by three English ships, but, engaging the first, so injured her that he was able to escape.

Sailed at intervals during the war in letters of marque. Made senior officer of the navy in 1794. In command of the "United States" (44) at Philadelphia, and was influential in having set on foot the construction of those heavy frigates that won so many victories. During the war with France he cruised in European waters in the "United States," protecting our commerce. He died at Philadelphia, September 13, 1803, at the age of 58. He was the third commander-in-chief of the navy.—*F. S. Bassett, Lieutenant U.S.N.*

Barse. The common river-perch.

Bar-shot. Two half balls joined together by a bar of iron, for cutting and destroying spars and rigging. When whole balls are thus fitted they are more properly double-headed shot.

Bart, Jean. Born at Dunquerque, October, 1650. Died in the same place, April, 1702. The life of Jean Bart is, or was, a text-book in the French naval schools, and his memory has always been preserved among the French seafaring population as a type of a French sailor. He is to the French navy what Bayard and Latour d'Auvergne are to the army. In the English navy every old prejudice, as well as the custom of hard fighting, is said to come down from Benbow, and so in the French navy all such traditions are traced to Jean Bart. He was a member of a seafaring family of Dunquerque, on the very N.E. confines of France. He was rather more Flemish than French, in fact.

His father commanded a *corsaire* (somewhat equivalent to a "letter of marque") out of the port of Dunquerque. Jean Bart went to sea at twelve years of age, and long before his majority became "second" of a brigantine, with the euphonious name of the *Cochon Gras*, or "Fat Hog," which cruised in the dangerous navigation of the English Channel as a lookout against the advance of the British fleet.

In 1666, Jean Bart entered the Dutch Marine, serving under the celebrated Admiral de Ruyter in the war with the English. He returned home in 1672, having attained the rank of lieutenant, leaving the Dutch service on account of war breaking out between Holland and France. Still a very young man, he commenced his career as *corsaire*, and for six years his wholesale captures of Dutch vessels caused his name to be known in all northern ports.

In 1679, upon the recommendation of the celebrated Vauban, Jean Bart was commissioned as *lieutenant de vaisseau* in the French Royal Marine.

In 1681 he was sent by Colbert, in command of two frigates, against the Salee pirates. He made a brilliant cruise, bringing back with him many important Moorish prisoners. Two years after, during the war between France and Spain, he made important and successful cruises in the Mediterranean, and was advanced to the rank of *capitaine de frégate*. At this time he organized squadrons of fast frigates and *corsaires* combined, and so drilled them that they were not only able to greatly interfere with the enemy's commerce, but were able to unite and fight in line upon occasion.

By this time his reputation as a bold and skillful commander was so well established that his services were always sought for when anything especially difficult or daring was to be attempted by sea.

In 1689 he convoyed a fleet of powder and provision vessels from Calais to Brest, fighting his way down the channel through a fleet of English and Dutch cruisers. During one of these fights he saw his son, a child of ten years old, showing some trepidation, and at once had him lashed to the mainmast until the action was over. This boy became a vice-admiral in the French navy.

Soon after this Jean Bart was, with Captain the Chevalier Forbin, wounded and taken prisoner in a bloody frigate action in the channel. They were taken to Plymouth, but, owing to the stubborn resistance of the men-of-war, their convoy escaped. He was not many days a prisoner, but succeeded in escaping during foggy weather, and, with Forbin and two or three sailors, seized the yawl of a merchant vessel, and pulled for the French coast. After forty-eight hours of exposure and excessive labor, they landed on the coast of Brittany, near St. Malo. Both he and Forbin were made *capitaines de vaisseau* for this exploit.

Jean Bart was soon at sea again, this time in command of a squadron of frigates, with which he fought several actions and made captures.

In 1690 he commanded the frigate "Alcyon," in Tourville's fleet, with great approval from his admiral; and, upon his return from this cruise, he was allowed to carry out his idea of forming a special squadron to destroy the Dutch commerce in the North Sea and in the Baltic.

By the time he had, at Dunquerque, got ready seven frigates and a fire-ship, he found himself blockaded by thirty-five English and Dutch vessels. He managed, however, to elude them all, and to make his cruise, during which he burnt nearly a hundred English vessels, landed near Newcastle, burnt a number of houses, and returned safely to his port, with his squadron intact and laden with spoil. Never willing to be idle, he was soon off again into the North Sea, this time with only three ships, and again returned with prizes.

Jean Bart's fame was now such that he was sent for by Louis XIV., when the brilliant courtiers of that august monarch were much amused with his brusque manners and ways. He had already been popularly called "the Sea Bear," and all sorts of stories are told of how he bore himself in the presence of the "Sun of France,"—how he smoked his pipe in his presence, clapped the princes of the blood on the back, and generally behaved as a genuine *loup-de-mer*. There appears to be little truth in these relations. Jean Bart was no doubt of simple, plain manners, but long before this period he had associated with some of the best men in France, and he had commanded fleets very successfully. It is not likely, therefore, that he would have been found wanting in common courtesy. The fact appears to be that the stories told of his behavior at court were only a corollary to those popularly related of him, so great was the enthusiasm created by his exploits.

It has been said by Eugène Sue, in his "Histoire de Marine," that Jean Bart could not write, and only signed his name mechanically. This is not probable in the case of one who was a good navigator. The "Archives de la Marine" show exceedingly well-formed signatures of his, although the letters themselves are written by a clerk, as is the case in all services and at all times. The naval registers of Dunquerque show the same thing. M. Vanderest, in his "Histoire de Jean Bart," disposes of these stories in an enthusiastic but complete fashion.

Portraits of Jean Bart show him to have been a square-built man, of fair height, with a good, open, Flemish countenance, blue eyes, and light hair. He spoke several languages, including English, but, it is said, spoke French with a Flemish accent.

In 1693, Louis XIV., wishing to repair the disgrace of La Hogue, gave Tourville command of a new fleet, in which Jean Bart commanded the "Glorieux," and in her fought at the battle of Lagos.

After this he had command of a squadron of six frigates to escort an immense convoy of grain, and succeeded in getting his charge safely into Dunquerque, after a severe battle with the Anglo-Dutch fleet. By this action he saved that part of France from impending famine; and the event was considered so important that a medal was struck to commemorate it. In the same year Jean Bart took three English frigates and their convoy of transports, loaded with provisions and stores.

In 1694, Louis XIV. gave Jean Bart *lettres de noblesse*, with the cross of Saint Louis, and the right to wear the *fleur-de-lis* in his arms.

In the same year the ennobled sailor narrowly missed capturing, in the North Sea, William of Orange, who was returning from Holland to England. A curious speculation could be elaborated upon the result of such a capture. Certainly William would have fared badly as prisoner of Louis XIV., and most likely James II. would have had the English throne.

In 1696, Jean Bart went cruising in the North Sea again, and though, as usual, blockaded in Dunquerque by a strong Anglo-Dutch fleet, he succeeded in eluding them and getting to sea. Just north of the Texel he encountered the Dutch Baltic fleet, and captured their escort of frigates and some forty merchant vessels. When about to take possession of them a very superior force of the enemy hove in sight, and Jean Bart was obliged to burn his prizes, which he did thoroughly, and then made sail in retreat in line of battle, the enemy not caring to pursue. His thorough ability and boldness on this occasion elicited the admiration of the very men opposed to him. Forbin, in his "Mémoires," pretends that Jean Bart was only fitted for frigate actions and *coups de main*, but we have seen that he handled squadrons well, and his dispatches concerning such affairs were always clear and well considered. On his return from this cruise Louis XIV. sent for him, and said, "Jean Bart, I have made you *chef d'escadron*" (commodore,—a higher rank than in our day). "Sire," Jean Bart replied, "you have done well." In the previous year the "Grand Monarque" had hurt Jean Bart's feelings by telling him he had not done as well as usual.

In 1697, Jean Bart took the Prince de Conti to Dantzic, where he went in the hope of obtaining the throne of Poland. On their voyage they were met by an enemy's squadron of no less than nine line-of-battle ships, but they succeeded in escaping from them. The prince said, "We were near being taken!" "Oh, no," said Jean Bart: "I had my son in the magazine, to blow us up before that should happen." The prince was, naturally, shocked at this, and said, "Your remedy is worse than the evil! I forbid anything of the kind while I am on board." Conti got safe to Dantzic, but, as we all know, effected nothing.

In 1697 occurred the peace of Ryswick, and then Jean Bart, for the first time in his life, had a period of repose, which he spent most simply, with his family, at Dunquerque.

As soon as the war of the Spanish Succession broke out he was ordered to command a fleet again. Unfortunately, in his personal exertions in pressing on the preparations he caught cold, had a pleurisy, and died, in April, 1702, just at the time that France had most need of him, for she was soon to be brought to suffer great disasters, both by sea and land.

His successor in the fleet never tried to pass the blockade, as Jean Bart had done so often, and by so doing kept ten times his number employed against him.

Jean Bart was only fifty-two years old when he died, and the loss of no man of his time was more deplored.

In spite of all his prizes he had saved very little money, but the king gave his widow a pension of 2000 crowns.

In 1845 a statue to Jean Bart, by the celebrated David, was erected at Dunquerque. As has been stated, his son became a vice-admiral, and died at the age of 78. His grandson became a *chef d'escadron*, and died in 1784, being the last of his direct descendants.

The last of the descendants of his brother, and the last who bore the name of the great French sailor, died a *lieutenant de vaisseau* in 1843.—*E. Shippen.*

Barton, Wm. P. C., Surgeon U.S. Navy. Born in Philadelphia, Pa., November 17, 1786. He was descended from Rev. Thomas Barton, an Episcopal clergyman who came to America under the patronage of the Penn family, and married in Philadelphia the sister of David Rittenhouse, the celebrated mathematician and astronomer, and the first president of the Philosophical Society. Dr. Barton received his classical education at Princeton College, where he graduated with distinction at an early age. He commenced the study of medicine under the direction of his uncle, Dr. Benjamin Smith Barton, and graduated at the University of Pennsylvania in 1808. After graduating Dr. Barton commenced the practice of medicine in Philadelphia. He was surgeon at the Pennsylvania Hospital, and upon recommendation of the celebrated Dr. Benjamin Rush and Dr. Physick he was appointed surgeon in the navy. He was for many years on active duty, and distinguished himself in the treatment of cases, and by his great skill in the performance of difficult and delicate operations. During his reliefs from sea service he was not content to pass his time unemployed, but devoted himself with great professional ardor to the publication

of various works, which acquired at the time considerable reputation. Among others, his work on "Marine Hospitals" (published in 1814); his "Vegetable Materia Medica," and "Flora of North America," with drawings from nature, made by himself and colored by his wife (published in 1817 and 1818); his translation of the work of the celebrated Gregory on the influences of climate, and other treatises, were extensively circulated, and gained for their author considerable celebrity. He was chosen professor of botany in the University of Pennsylvania, became a Fellow of the College of Physicians of Philadelphia, a member of the American Philosophical Society, president of the Linnæan Society, and honorary member and surgeon of the First City Troop. Upon the creation of the Bureau of Medicine and Surgery in the navy, Dr. Barton was tendered and accepted the appointment of chief of that bureau. In this position he introduced many reforms, corrected and abolished many abuses, and secured the warm commendation and approval of the government. He resigned his position as head of the bureau, but retained his commission in the navy, and had been at the time of his death for several years the senior surgeon of the navy. He died at Philadelphia, February 29, 1856.

Baruth. An East Indian measure, with a corresponding weight of 3½ pounds avoirdupois.

Base. The hemispherical portion of the breech of a gun. The lowest part of the perimeter of a geometrical figure. When applied to a delta it is that edge of it which is washed by the sea, or recipient of the deltic branches. The lowest part of a mountain or chain of mountains. The level line on which any work stands, as the foot of a pillar. An old boat-gun; a wall-piece on the musketoon principle, carrying a 5-ounce ball.

BASE-LINE. In surveying, the base on which the triangulation is founded. In gunnery, a line traced around the breech of a gun, which marks the division between the breech and cylinder.

BASE OF OPERATIONS. That secure line of frontier or fortresses, or strong country occupied by troops, or of sea occupied by fleets, from which forward movements are made, supplies furnished, and upon which a retreat may be made, if necessary.

BASE-RING. A molding around the breech of a gun, between the base and first reënforce.

Bashaw. A Turkish title of honor and command; more properly *pacha*.

Basil. The angle to which the edge of shipwrights' cutting tools is ground away.

Basilicus. A name of Regulus, or the Lion's Heart, *a Leonis;* a star of the first magnitude.

Basilisk. An old name for a long 48-pounder, the gun next in size to the carthoun: called basilisk from the snakes or dragons sculptured in the place of dolphins. Also, in still earlier times, a gun throwing an iron ball of 200 pounds weight.

Basillard. An old term for a poniard.

Basin. A wet-dock provided with flood-gates for restraining the water, in which shipping may be kept afloat at all times of tide. Also, all those sheltered spaces of water which are nearly surrounded with slopes from which waters are received; these receptacles have a circular shape and narrow entrance. Geographically basins may be described as upper, lower, lacustrine, fluvial, mediterranean, etc.

Basket-fish. A name for several species of *Euryale;* a kind of star-fish, the arms of which divide and subdivide many times, and curl up and intertwine at the ends, giving the whole animal something of the appearance of a round basket.

Basket-hilt. The guard continued up the hilt of a cutlass, so as to protect the whole hand from injury.

Basking Shark. So called from being often seen lying still in the sunshine. A large cartilaginous fish, the *Squalus maximus* of Linnæus, inhabiting the Northern Ocean. It attains a length of 30 feet, but is neither fierce nor voracious. See SAIL-FISH.

Bass, or Bast. A soft sedge or rush (*Juncus lævis*), of which coarse kinds of rope and matting are made. A Gaelic term for the blade of an oar.

Basse. A species of perch (*Perca labrax*), found on the coast and in estuaries, commonly about 18 inches long.

Bassos. An old term for *shoals*. Rocks a-wash, or below water.

Bast. The inner bark of the lime-tree or linden, hence the cordage or mats made from this bark. See BASS.

Basta. A word from the Italian, in former use for *enough*.

Bastard. A term applied to all pieces of ordnance of unusual or irregular proportions. A square-sail in use in some Mediterranean craft; it was occasionally used as an awning.

Bastard-mackerel, or Horse-mackerel. The *Caranx trachurus*, a dry, coarse, and unwholesome fish of the family *Scomberidæ*.

Bastard-pitch. When a mixture of equal parts of colophony, black pitch, and tar is boiled down, it forms a liquid substance called by the French *bray gras*. When a thicker consistence is required more colophony is added, and it is then called *bastard-pitch*.

Baste. To beat; to cudgel. To sew with long stitches.

Bastile. A temporary wooden tower used formerly in military and naval warfare. The name is specifically applied to an old fortification in Paris built in the 14th century, long used as a state prison, but demolished by the populace in 1789.

Bat, or Sea-bat. An Anglo-Saxon word for boat or vessel. A broad-bodied thoracic fish (*Chætodon vespertilio*).

Batardate. A square-stemmed row-galley.

Batardeau. Planks to prevent the entrance of water when a ship is hove down for repairs.

Batardelle. A galley less strong than the capitana.

Batavia. A city and seaport of Java, at the mouth of the Jukatra River, on the N. coast of the island, with a free port, extensive and safe. Lat. 6° 8′ S.; lon. 106° 50′ E. The bay or harbor forms a roadstead of great beauty, and may be entered by vessels of the largest class. Pop. 100,000.

Bateau. A flat-bottomed, sharp-ended, clumsy boat used on the lakes and rivers of Canada. A peculiar army pontoon.

Bated. A plump, full-roed fish is said to be *bated*.

Batella. A small plying-boat.

Bath (Maine). A city and port of entry on the right bank of the Kennebec River, 12 miles from the ocean, 36 miles N.E. of Portland. Wooden ship-building is carried on at Bath to a very large extent. Pop. 11,000.

Bath-brick. A preparation of calcareous earth in the form of a brick, used for cleaning bright-work.

Bathometer. A sounding apparatus, which see.

Bathymetry. The art or science of measuring the depth of the sea.

Batillage. An old term for boat-hire.

Batman. A weight used in the East, varying according to locality.

Bat-swain. An Anglo-Saxon expression for *boatswain.*

Battard. An early cannon of small size.

Batteloe. A lateen-rigged vessel of India.

Batten. Scantlings from one inch to three inches broad. Long slips of timber used for setting fair the sheer lines of a ship, for staying the lower masts, and for setting off distances generally. Strips of wood secured to masts, yards, or rigging to protect them from chafe. Slips of wood used for confining the edges of the tarpaulins over the hatches.

To BATTEN DOWN THE HATCHES, to haul over the tarpaulins and secure them by nailing battens over them.

Battering Charge. A charge of powder heavier than the ordinary charge, to be used against ironclads or masonry at short range for a limited number of fires.

Battering-guns, or Battering-pieces. Guns whose weight and power fit them for demolishing by direct force the works of the enemy.

Battery. A place where guns or mortars are mounted. A body of cannon taken collectively; as, the starboard battery. Two or more pieces of artillery in the field. *Barbette battery*, one without embrasures. *Floating-battery*, a vessel heavily clad with iron, and having little or no steam-power, used for harbor defense; a battery mounted on a raft or hulk. *Masked, or covered battery*, one concealed from the enemy by a bank or breastwork until it opens fire. *Water-battery*, one close to and nearly on a level with the water. *Mortar-batteries* have no embrasures, the mortar being generally fired at an angle of 45°. See ELECTRIC BATTERY, GALVANIC BATTERY.

Battle-lantern. A lantern supplied to each gun for lighting up the decks during an engagement at night.

Battle-royal. A term derived from cock-fighting, but generally applied to a noisy, confused row.

Battle the Watch. To contend with a difficulty; to shift as well as one can; to depend on one's own exertions.

Bat-ward. An old term for a boat-keeper.

Bavin. See BORE.

Baw-burd. An old expression for *larboard.*

Bawdrick. A corruption of *baldrick.*

Bawe. A species of worm used for bait for fish.

Bawgie. One of the names given to the great black and white gull (*Larus marinus*).

Bawkie. A name for the awk, or razor-bill.

Baxios (*Sp.*). Rocks or sand-banks covered with water.

Bay. An inlet of the sea, having a wide entrance, and usually smaller than a gulf, although many large sheets of water are named bays. Of the many names adopted to designate inlets from the seas, those of fiord and viik may be properly included under the head of bays. The greater portion of inlets so named are of salt water, but many fresh-water bays exist, especially in the great American lake-region. An enumeration of the bays would require several pages, and some that are not from their size geographically important are remarkable nevertheless from the rivers that empty into them, as Delaware Bay; the cities that are situated on them, as Boston Bay; from natural causes, as Fundy Bay from its great rise of tides; from historical reasons, as Aboukir Bay; from strategical causes, as Gibraltar Bay; or from some use made of them, rendering them peculiarly notable, as Botany Bay, the home of English convicts.

Keith Johnston, in his "Royal Atlas," enumerates more than a thousand bays, and this number would doubtless increase threefold on a careful count of our charts of the known coasts of the world. Of these, Europe has by far the greater number, there being about 440 on the chart, and North America comes next with 230, while South America and Oceanica have upwards of 100 each, and Asia has upwards of 80, Africa having no more than 60. Of European countries, the British Isles have the most bays, and Norway comes next with her *fiords.* Holland, Belgium, and Corsica have none; Italy, Portugal, Austria, and Turkey one each.

The principal bays of Asia are the Tidanski, Taimurski, Katangski, and Borkaia on the Arctic Ocean, Avatcha, Ulbansk, Vladimir, Victoria, Broughton, Hangchow, Yeddo, Hakodadi, Wanchow, Manila to the eastward, and the great Bay of Bengal on its south shores.

The principal African bays are Sofala, Delagoa, and Algoa to the eastward, False, Table, St. Helena, and Walfisch on the west, Algiers, Tunis, and Arab bays to the northward. Neustadt, Kiel, and Lübeck on the Baltic, Cardigan, Donegal, and Galway in the British Isles, and Biscay, Cancale, and Fetubâl on the west coast, comprise the principal European bays. North America has many large bays, chief of which are Mackenzie, Baffin's, Frobisher's, Hudson, James, Ungava, and Cumberland on the north coast, Melville and Disco in Greenland, Bay of Fundy, Massachusetts, Cape Cod, Delaware, Chesapeake, Long, and Onslow bays on the east coast, Appalachicola, Pensacola, and Galveston on the Gulf, Campeachy, Fonseca, and Tehuantepec in Mexico and Central America, and Magdalena, Seb. Vizcaino, Monterey, San Francisco, and Bristol bays on the west coast. South America has Bahia de Todos os Santos, Rio Janeiro, and White bays on its east coast, and Arauco, Coquimbo, Salado, Moreno, Pisco, Sechura, and Buenaventura on her west coast. Australia is well provided with bays, Prince Charlotte, Hervey, Encounter, Geographe, and Shark bays being the most important.

Three bays are particularly noticeable from their great size, viz.: 1. Bay of Bengal. This is a triangular sheet of water, an arm of the Bengal Sea, washing the northeastern shores of Hindostan and the west coast of Pegu. It ex-

tends over 6 degrees of latitude and 10 of longitude, being about 200,000 square miles in area. It is the recipient of the great Brahmapootra, Ganges, and Shina rivers, but contains no obstacles to navigation except near the land. 2. Bay of Biscay. This is a trapezoidal-shaped bay, an arm of the Atlantic, washing the southwest coast of France, where its shores are low and marshy, and the rocky and mountainous north coast of Spain. It embraces some 8 degrees of latitude and 5 of longitude, being about 125,000 square miles in area. It receives the waters of the Adour, Garonne, and Loire. 3. Hudson's Bay, discovered in 1615 by Hendrik Hudson. It is situated wholly within the North American continent, and is nearly square, having, as an addition, James Bay, itself of some extent. Hudson's Bay occupies some 9 degrees of latitude and 14 of longitude, and contains some 300,000 square miles of area. It communicates with the Atlantic by a strait of the same name, and with the Arctic Ocean by several passages. Some idea of the great size of these bays is obtained by a comparison with countries. The Bay of Bengal is as large as Germany, or its own neighbor, Siam. The Bay of Biscay is as large as Holland, and Hudson's Bay would about cover Spain.—*F. S. Bassett*, *Lieutenant U.S.N.*

Bay. The fore part of the ship between decks. See SICK-BAY.

Bayamos. Violent blasts of wind blowing from the land, on the south coast of Cuba, and especially from the Bight of Bayamo. They are accompanied by wind and lightning, and generally terminate in rain.

Bay-bolt. A bolt with a barbed shank.

Bay-gulf. A branch of the sea of which the entrance is the widest part, as contradistinguished from the strait-gulf.

Bay-ice. Ice newly formed on the surface of the sea, and having the color of the water; it is then in the first stage of consolidation. The term is sometimes applied to ice a foot or two in thickness in bays.

Bayle. An old term for *bucket.*

Bayonet. A short triangular dagger fitted to the muzzle of a musket or rifle, for the purpose of giving the fire-arm effect as a thrusting weapon. It takes its name from Bayonne, France, where it is said to have originated. It was first used by the French in the Netherlands in 1647. Formerly the handle of the bayonet was inserted into the bore of the fire-arm, and had to be unfixed when the piece was fired; to remedy which it is now made with a hollow handle and a shoulder so that it fits over the barrel, and sets off from the line of fire. Modifications affecting the shape of the blade have also been made, of which the sabre-bayonet and the more recent trowel-bayonet are examples. The latter form of bayonet, invented by Bvt. Lt.-Col. Rice, U.S.A., is less sightly than the triangular, either fixed or worn as a side-arm, but is most valuable as an intrenching tool to forces operating on land.

Bayou. The outlet of a small lake; a creek or small river.

Bazaras. A large pleasure-boat of the Ganges impelled by oars and sails.

Beach. A shelving tract of sand or shingle washed by the sea or a lake, and interposed between the water and the land on which vegetation grows. The beach of the ocean is, generally speaking, little more than the space between low- and high-water mark; the beach of a lake that between the water-marks of the highest and lowest ordinary level of the lake. An inland sea without tide, such as the Mediterranean, has generally little beach, except on flat coasts, where the waters are apt to rise and fall considerably, according to the prevailing winds. To land a person with the intention of deserting him, an old buccaneer custom. To run a boat or a vessel on the beach, either to land or for the purpose of repairs where there are no other accommodations. See SURF.

BEACH-COMBERS. Long waves rolling in from the ocean. Loiterers around a bay or harbor.

BEACH-COMBING. Loafing about a port to filch small things.

BEACH-FLEA. A small crustacean (*Talitra*) frequenting sandy shores.

BEACH-GRASS. *Alga marina* thrown up by the surf or tide.

BEACH-MAN. A person on the coast of Africa who acts as interpreter to shipmasters, and assists them in conducting trade.

BEACH-MASTER. An officer appointed to superintend the disembarkation of an attacking force, who holds plenary powers, and generally leads the storming party.

BEACH-MEN. A name applied to boatmen and those who land people through a heavy surf.

BEACH-RANGERS. Men hanging about seaports, who have been turned out of vessels for bad conduct.

BEACH-TRAMPERS. A name applied to the coast-guard of England.

Beacon. A post or stake erected over a shoal or sand-bank, as a warning to seamen to keep at a distance; also a signal-mark placed on the top of hills, eminences, or buildings near the shore for the safe guidance of shipping.

BEACONAGE. A payment levied for the maintenance of beacons.

Be-aft. A term frequently used by sailors for *abaft.*

Beak, or Beak-head. A piece of brass like a beak, fixed at the head of the ancient galleys, with which they pierced their enemy's vessels. Pisæus is said to have first added the rostrum or beak-head. Later it was a small platform at the fore part of the upper deck, but the term is now applied to that part without the ship before the forecastle, or knee of the head, which is fastened to the stem and is supported by the main knee. Latterly the whole of this is enlarged, strengthened, and armed with iron plates, and thus the armed stem revives the ancient strategy in sea-fights.

Beam. A long double stratum of murky clouds generally observed in the Mediterranean previous to a violent storm. A collection of parallel rays emitted from the sun or other luminous body. Any large piece of timber or iron long in proportion to its other dimensions. One of the heavy transverse timbers which support the deck and retain the sides of a ship in shape. *Beam*, or *breadth of beam*, the width of a ship. *On the beam*, in a line with the beams, or at right angles to the keel.

BEAM CENTRE. The fulcrum on which the walking-beam vibrates.

BEAM-ENDS. A ship is said to be *on her beam-*

ends when she has heeled over so much that her beams approach a vertical position. The expression is used figuratively for a person in distress.

BEAM-ENGINE. An engine with an oscillating beam, by which the power is transmitted from the piston to the shaft.

BEAM-FILLINGS. Short pieces of wood to fit between the beams, to complete a cargo of timber.

BEAM-LINE. A line which indicates the intersection of the upper part of the beams with the frames of a ship.

BEAM, WALKING-. The beam of a beam-engine, called also *working-beam.*

Bean-cod. A small fishing-vessel, or pilot-boat, common in Spain and Portugal. It is fitted with a large lateen-sail, and sometimes has an outrigger over the stern. It is extremely sharp forward, and works well to windward.

Bear. A coir-mat filled with sand, or a block of stone, matted, loaded with shot, and fitted with ropes, for hauling to and fro to grind the decks.

Bear. *To bear down* upon a vessel is to approach her from to windward. *To bear up*, to put the helm up and run off to leeward. *To bear sail*, stiff under canvas. *To bring the guns to bear*, to so lay the ship's head that the guns may be pointed at the enemy. *To bear in with* (or *off from*) the land is to stand in toward (or off from) the coast. *To bear off*, to push one object off from another; as, a lighter from the ship's side.

BEAR A BOB, OR A FIST. Jocular for *lend a hand.*

BEAR A HAND Hasten.

Beard. The silky filaments by which some testacea adhere to the rocks. The gills of an oyster. The rays of a comet emitted toward that part of the heavens to which its proper motion seems to direct it.

Bearding. The diminution of the edge or surface of a piece of timber from a given line; as, on the stem, deadwood, etc.

Bearding-line. The trace of the inner surface of the ship's skin on the keel, stem, and stern-post.

Bearer. An instrument used in handling heavy shells.

Bearing. The manner in which a person conducts himself. The portion of an axle or shaft in contact with its supports. The bearing of an object or place is the angle contained between the meridian and the vertical plane through the object. It is the same as the *course* to the place.

BEARING, COMPASS. The bearing of an object as observed by the compass. It is the angle between the needle of the standard compass on board the ship of the observer and the direction of the object: it is, therefore, affected by the deviation and variation of the compass. If the correction for deviation be applied, the *True Magnetic Bearing* is obtained; and if, further, the correction for variation be applied, the *True Bearing* or *Azimuth* is deduced.

BEARING, MAGNETIC. The magnetic bearing, or "*True Magnetic Bearing*," of an object is the angle which its direction makes with the magnetic meridian. This is the bearing which is observed with the azimuth compass after being corrected for local deviation; from it the *True Bearing* is deduced by applying the correction for variation.

BEARING, TRUE. The true bearing of an object, or the "*Bearing*," properly so called, is the angle which the direction of the object makes with the meridian. It is thus qualified to distinguish it from the *Compass* and *Magnetic Bearing*. See AZIMUTH.

BEARING, TAKING A. Taking a bearing of an object is to ascertain its direction by the compass.

BEARINGS, CROSS. "Cross Bearings" are the bearings of two or more objects taken from the same place, and therefore intersecting or "crossing" each other at the station of the observer. When near a coast where the landmarks are well laid down on the chart, cross bearings give the position with ease and accuracy.

BEARING, LINE OF. If a ship is in the vicinity of land, one "*Circle of Equal Altitude*" (Sumner's Method) is often of great use to the navigator who is uncertain of his exact position. He is on some point of this circle, but does not know where. Let him project it on his chart and produce the resulting line till it meets or passes near the land. Such a line is called a "Line of Bearing." If it hit any prominent mark or light, the *bearing* of this is known, and by sailing along the line of bearing till the object is sighted, the exact position of the ship may be picked up. The line of bearing may cross the range of a light-house, and consequently, when the light is first sighted, the exact position of the ship is known. Or the position on the line of bearing may be found by soundings. When the coast trends parallel to the line of bearing, the distance of the ship from the shore is indicated, though her absolute position is uncertain.

Bearing Binnacle. A small binnacle, generally placed in the centre of the forward part of the poop-deck.

Bearings. The widest part of a vessel below the plank-shear. The line of flotation when properly trimmed with stores and ballast on board. *To bring a person to his bearings* is to bring him to his senses; to put him under control.

Beat. To make progress against a head wind by a series of zigzag courses.

Beaten Back. Forced to return on account of a head wind and sea.

Beating Wind. A wind which necessitates tacking to make progress.

Beating the Booby. Swinging the arms from side to side to create a warmth by accelerating the circulation of the blood.

Beaufort (S. C.), a port of entry, on Port Royal or Beaufort Island, on an inlet called Port Royal River, about 14 miles from the ocean, and 55 miles W.S.W. of Charleston. Pop. 2000.

Beaumont, J. C., Commodore U.S.N. Appointed midshipman, March 1, 1838; sloops-of-war "Ontario" and "Erie," 1838–40; frigate "Constellation" during her cruise around the world, 1840–44.

Promoted to passed midshipman, 1844; sloop-of-war "Jamestown," coast of Africa, acting master, 1844–46; ship-of-the-line "Ohio," West India Squadron, 1846; at the fall of Vera Cruz; frigate "Columbia," 1847, acting lieutenant; Naval Observatory, Washington, D. C., 1848; razee "Independence," Mediterranean Squadron, master and acting lieutenant, 1849–52.

Promoted to lieutenant in 1852; Naval Ob-

servatory, 1852–54; steamer "San Jacinto," on the coast of Europe and the West Indies, 1854–55; frigate "Potomac," Home Squadron, 1856; steam-frigate "Wabash," Home Squadron, 1857; receiving-ship at New York, 1857–58; steam-sloop "Hartford," East India Squadron, 1859–60; sloop-of-war "John Adams," executive-officer, 1860–61; lieutenant-commander, commanding steamer "Aroostook," North Atlantic Squadron, 1862; was an active participant in the engagements with the enemy's batteries in the James River and at Fort Darling, in May, 1862.

Promoted to commander, 1862; commanded the steam-gunboat "Sebago," South Atlantic Squadron, 1862–63; commanded monitor "Nantucket," 1863, in various engagements with the rebel fortifications in Charleston harbor, and took a leading part in the capture of Fort Wagner; commanded steamer "Mackinaw," 1864–65, in the North and South Atlantic Squadrons; participated in all of the attacks on Fort Fisher, where his vessel was badly cut up by the enemy's shell; participated in all of the subsequent engagements with the rebel batteries on the Cape Fear River; commanded the iron-clad "Miantonomah," special cruise on the coast of Europe, 1866–67; retired in 1868.

Restored to the active list in 1873, as captain; commanded the steamer "Powhatan," 1873–74, special service.

Promoted to commodore in 1874; chief signal-officer of the navy, 1875–79; commandant navy-yard, Portsmouth, N. H., 1879–80.

Becalm. To render quiet or calm by intercepting the current of air in its passage to the object; thus the jib is becalmed by the foresail when before the wind.

BECALMED. Rendered quiet. State of a vessel at sea when there is no wind.

Becket. A small grommet used for various purposes; as, for reefing with toggles, for hitching the standing part of a fall, etc. A sailor's name for *pocket*.

Bed. Flat thick pieces of wood, lodged under the quarters of casks containing any liquid, and stowed in a ship's hold, in order to keep them bilge-free; being steadied upon the beds by means of wedges called quoins. The impression made by a ship's bottom on the mud when aground. The bite made in the ground by the fluke of an anchor. A kind of false deck, or platform, placed on those decks where the guns were too low for the ports. A platform for supporting a mortar. That part of the channel of a stream over which the water generally flows, as also that part of the basin of a sea or lake on which the water lies. *Bed of a gun-carriage*, or *stool-bed*. The piece of wood between the brackets which, with the intervention of the quoin, supports the breech of the gun. It is itself supported, forward, on the *bed-bolt*, and aft on the rear axle. *Bed of the bowsprit*, a bearing formed out of the stem and apron, to support the bowsprit; it is lined with lead to prevent the water from getting below on account of any shrinkage in the timber.

BED-BOLT. A horizontal bolt passing through both brackets of a gun-carriage, and on which the forward end of the stool-bed rests.

BEDDING A CASK. Placing dunnage round it.

Bedlamers. Young Labrador seals, which set up a dismal cry when they cannot escape their pursuers.

Bed- or Barrel-Screw. A powerful machine for lifting large bodies, and placed against the gripe of a ship to be launched for starting her.

Be-dundered. Stupefied with noise.

Bee-blocks, or Bees. Pieces of hard wood bolted to the sides of the bowsprit, through which are rove the fore-topmast stays.

Beef. A figurative term for strength. *More beef!* more men on.

Beef-eater. A man more distinguished for physical strength than for mental weight. It is Jack's term for an Englishman.

Beetle. A shipwright's heavy mallet for driving the reeming-irons.

Beetle-head. A large beetle used in pile-driving.

Before the Mast. A term used to distinguish the ship's crew from the officers.

Before the Wind. A vessel having the wind aft is *before the wind*. The yards are squared, and as the mainsail becalms the foresail and causes the ship to steer badly, it is generally taken in, though in the very long ships of the present day it is sometimes carried.

Beggar-bolts. A contemptuous term for the missiles which were thrown by the galley-slaves at an approaching enemy.

Behavior. The action and qualities of a ship under different impulses. Seamen speak of the manner in which she *behaves* as if she acted by her own instinct.

Behring, Vitus, a celebrated Danish navigator. Born in Jutland, 1680, entered the Russian navy at an early age, and fought with distinction against the Swedes. In 1725 engaged in command of an expedition to explore the Sea of Kamtchatka, this skillful Danish navigator discovered in 1728 the straits which connect the Pacific and the Atlantic, and they received his name. In a subsequent voyage he was wrecked on Behring's Island, where he died December 8, 1741.

Beikat. See BYKAT.

Beiled. A sea-term in the old law-books, apparently for moored.

Belay. To secure a rope with turns around a pin, cleat, or cavil.

BELAYING-PIN. A small pin of wood or iron to which are made fast the hauling parts of the running-gear.

Belcher, Sir Edward. Born in 1799, entered the navy in 1812 as a volunteer; in 1816 took part in the bombardment of Algiers. Distinguished above every other British admiral for his voyage round the world and his exploration of the American shores of the Pacific, he was nevertheless unfortunate in an attempt that he made in 1852 to trace the whereabouts or the fate of Sir John Franklin. He lost both of his ships in the enterprise, and was, according to custom, tried by court-martial for the disaster. The verdict was honorable acquittal. In 1864 he became rear-admiral of the red.

Belfast (Me.). A city and port of entry on the W. side of Penobscot Bay (which is the estuary between the Penobscot River and the ocean), 42 miles E. by N. from Augusta, and 30 miles from the ocean. Many of the inhabitants are employed in ship-building. Pop. 6200.

Belfry. A frame or shelter under which the ship's bell is suspended.

Bell. The rapid ringing of a ship's bell is the fire-alarm, which see. The tolling of the bell is the summons to divine service. The principal use of the bell on board ship is to mark the time. At four, eight, and twelve o'clock the bell is struck eight times,—half an hour afterwards it is struck once, and an hour afterwards it is struck twice, and so on until the end of the watch, when it is struck eight times, after which the preceding routine is again carried out. Time is reckoned by *bells*, thus *three bells* in the forenoon is half-past nine o'clock, and *four bells* in the afternoon is two o'clock, etc.

Bell, Charles H., Rear-Admiral U.S.N. Born in New York, 1798. Appointed midshipman June 18, 1812; attached to Commodore Decatur's squadron all of 1813 and until the spring of 1814; in the summer of 1814 was transferred to the squadron of Commodore Chauncey, on Lake Ontario, where he remained until the war ended; attached to Commodore Decatur's squadron, in the Mediterranean, in 1815.

Commissioned as lieutenant, March 28, 1820; serving in sloop-of-war "Erie," West India Squadron, 1829; navy-yard, New York, 1833; sloop "Vincennes," Pacific Squadron, 1834–35; commanding schooner "Dolphin," Pacific Squadron, 1836.

Commissioned as commander, September 10, 1840, and ordered to command the schooner "Dolphin," Brazil Squadron; commanding sloop-of-war "Yorktown," coast of Africa, 1846; navy-yard, New York, 1850; special duty, 1851–54.

Commissioned as captain, August 12, 1854; commanding frigate "Constellation," Mediterranean Squadron, 1856–58; commandant Norfolk navy-yard, 1860.

Commissioned as commodore, July 16, 1862; commanding Pacific Squadron, 1862–64; special duty, James River, 1865.

Commissioned as rear-admiral, July 25, 1866; commandant navy-yard, New York, 1866–68; died 1872.

Bell, Henry H., Rear-Admiral U.S.N. Born in North Carolina, 1808; midshipman, August 4, 1823; lieutenant, March 3, 1831; commander, August 12, 1854; captain, 1861; commodore, July 16, 1862; rear-admiral, July 25, 1866. First served in the "Grampus" in clearing the coast of Cuba of pirates. He commanded one of the vessels of the East India Squadron, which, in November, 1856, captured and destroyed the four barrier forts near Canton, China. Assigned to the Gulf Squadron in 1861, and as fleet-captain took an active part in the capture of New Orleans and siege of Vicksburg. He was for a time in 1863 in command of the West Gulf Squadron, and when Admiral Thatcher was ordered to other duty its command again devolved on him. In July, 1865, he was ordered to command the East India Squadron, and was very active in putting down the pirates that infested the Chinese seas. In 1867 he was retired, but had not been relieved when he was drowned at the mouth of the Osaka River, Japan, January 11, 1868.

Bella Stella. A name used by old seamen for the cross-staff.

Bellatrix (Lat. *warlike*). The name for the bright star γ *Orionis.*

Bell-buoy. A buoy on which is placed a bell, which is sounded by the action of the waves.

Belligerent (Lat. *bellum*, war, and *gerens, gerentis*, waging). Waging war. Tending or pertaining to war; as, *belligerent rights.* A nation, power, or state carrying on war. See INTERNATIONAL LAW.

Bellona. The goddess of war.

Bellows. *An old hand at the bellows*, a phrase equivalent to saying that a person is well posted in all his duties. When a gale increases the sailors say there is a *fresh hand at the bellows.*

Bell-rope. A piece of rope spliced around the clapper for convenience in striking the bell.

Belly. The inner or hollow part of compass timber. The swell of a sail. *Bellying canvas*, sails inflated with wind.

BELLY-BAND. A strengthening band of canvas from leech to leech, half-way between the lower reef-band and the foot of the sail.

BELLY-GUY. A rope or tackle applied half-way up a sheer-leg, or long spar, to keep it from buckling.

BELLY-MAT. See PAUNCH-MAT.

BELLY-STAY. See BELLY-GUY.

Belone. A genus of abdominal fishes of the *Esox* or pike family.

Below. The opposite of *on deck.* Below the spar-deck.

Belt. A zone; as, a calm belt. To strike.

Belting. A beating.

Beluga. A fish of the cetaceous order and dolphin family. The northern *beluga* is the white whale and white-fish of the whalers.

Benbow, John, Admiral. Born in Shropshire in 1650. Beginning life as a midshipman in the reign of James II., Benbow became a favorite of his successor, William III. After much hard service in different quarters he was engaged with a superior French force under Admiral Ducasse off St. Martha, in the West Indies, where he lost his right leg. In the midst of the fight he was deserted by a part of his squadron, which sorely galled him, as it reflected on the honor and credit of the navy. He exclaimed that he would rather have lost both legs than witnessed the disgrace of the service. Died November 29, 1702.

Bench-mark. One of a number of marks along a line of survey indicating a series of levels at different elevations.

Bend. To make fast a rope to an anchor, spar, or another rope. (See STUN'-SAIL-HALLIARD-, FISHERMAN'S-, SINGLE-, DOUBLE-, and CARRICK-BEND.) *To bend a sail* is to make it fast to its proper yard, gaff, or stay, and reeve all the gear belonging to it. *To bend to the oars*, to give way strong. *To bend the cable*, the operation of making fast the cable to the ring of the anchor. The term is still used for shackling the chain to the anchor.

Bender. A spree or jollification.

Bend-mold. A mold made to form the futtocks in the square body.

Bends. The thickest and strongest planks on the outward part of a ship's side. They are more properly called wales. They are reckoned from the water, and are distinguished by the titles of *first, second*, or *third bend.* They are the chief strength of a ship's sides, and have the beams, knees, and foot-hooks bolted to them. Bends are also the frames or ribs that form the ship's body from the keel to the top of the side, individualized by each particular station. That at

the broadest part of the ship is denominated the *midship-bend* or *dead-flat*.

Be-neaped. The situation of a vessel when she is aground at the height of spring-tides. See NEAPED.

Bengal-light. See BLUE-LIGHT.

Benicia (Cal.). On the north side of the Strait of Carquinez, about 40 miles N.E. of San Francisco, and 56 miles S.W. of Sacramento. It is at the head of navigation for the largest ships, and contains the depot and machine-shops of the Pacific Mail Company. Pop. 2000.

Benjy. A low-crowned straw hat, with a very broad brim.

Benk. A term for a low bank, or ledge of rock; probably the origin of *bunk*, or sleeping-places in merchant vessels. See BUNK.

Benn. A small kind of salmon.

Bent. The trivial name of the *Arundo arenaria*, or coarse unprofitable grass growing on the sea-shore.

Bentinck-boom. The boom which stretches the foot of the foresail in many small square-rigged merchantmen; particularly used in whalers in the ice, with a reefed foresail to see clearly ahead. The tack and sheet are thus dispensed with, a tackle amidships bringing the leeches taut.

Bentincks. Triangular courses, so named after Captain Bentinck, by whom they were invented.

Bentinck Shrouds. Ropes of the size of the topmast rigging, seized on to the weather futtock-staff and set up to the lee channels, to support the mast when rolling heavily. They are not now in use.

Bent on a Splice. Going to be married.

Bergen, a fortified city and seaport of Norway, is on a peninsula at the end of a deep bay on the Atlantic, 190 miles W.N.W. of Christiania. Lat. 60° 24′ N.; lon. 5° 18′ E. Bergen is the station of a naval squadron. Its harbor is deep and sheltered, and defended by several forts. Ship-building is carried on; the fishery is, however, the principal employment. Pop. 36,000.

Bermuda Sails. See 'MUGIAN.

Bermuda Squall. A sudden and strong wintry tempest experienced in the Atlantic Ocean, near the Bermudas; it is preceded by heavy clouds, thunder, and lightning. It belongs to the Gulf Stream, and is felt, throughout its course, up to the banks of Newfoundland.

Bermudez, Juan. A Spaniard who, in the era of Spanish discoveries (1522), came upon the cluster of islands in the West Indies, to which he gave his own name. The Bermudas, though often "vexed" with storms, are among the most beautiful of the isles of the west, and are particularly valuable as harbors for vessels bound either to the north or south of the American continent. They are now the property of Great Britain. "Somerset Island" derives its name from a navigator who was driven upon it in a gale.

Bermudians. Three-masted schooners, built at Bermuda for the English during the war of 1814; they went through the waves without rising to them, and consequently were too ticklish for northern stations.

Bernak. The barnacle goose (*Anser bernicla*).

Bersis. A species of cannon formerly much used at sea.

Berth. The place in which a ship lies when she is at anchor. Situation, position, or employment of an individual. The space allotted to a sailor to sleep in. *To give a point* or *rock a wide berth*, to keep at a considerable distance from it. *To berth a ship's company*, to allot to the crew the place in which they are to swing their hammocks. The watches are distributed in equal numbers on each side of the ship. The boys are berthed apart from the men. Marines, quartermasters, and others who sleep in till six bells are berthed well aft, so they will not be disturbed when all hands are called. Boatswain's mates swing near the hatches. Over each man's hammock-hook is hung a tin plate with his hammock-number.

BERTH-DECK. The deck next below the lower gun-deck.

Berthing. The rising or working up of the planks of the ship's side. Berthing also denotes the planking outside above the sheer-strake.

Bervie. A haddock split and half dried.

Berwick Smack (*Eng.*). The old and well-found packet of former days.

Bessemer Process. See STEEL.

Best Bower. See ANCHOR.

Betelguese, or Betelgeux. The name for the bright star *α Orionis*.

Betty Martin. *My eye and Betty Martin* is an expression implying disbelief. It is a corruption of the Romish *mihi, beate Martine!*

Between-decks. The space comprised between any two whole decks.

Betwixt Wind and Water. That portion of a vessel's side which is sometimes below and sometimes above the surface of the water. This is the most dangerous place to receive a shot, hence the figurative phrase "a shot betwixt wind and water," to express a palpable hit in an argument.

Bevel. Any angle except a right angle; a sloped surface. An instrument composed of a stock and movable tongue, used by shipwrights in getting out frame timber, plank, etc., to the desired angle.

BEVELING. The angle formed between one surface and another. When it is an obtuse angle it is called a *standing* beveling; when the angle is acute it is called an *under* beveling.

BEVELING-BOARD. A piece of white pine board on which the beveling of the frame timbers is described.

BEVELING-EDGE. The edge of a ship's frame which is in contact with the skin.

Bewpar. The old name for bunting.

Bezant. An early gold coin, so called from having been first coined at Byzantium.

Bhur. A lighter used for discharging cargo at Calcutta.

Bibbs. Pieces of timber bolted to the hounds of a mast, to support the tressle-trees.

Bible. A small holystone. It is also called a prayer-book. It is so named because sailors kneel in using them to clean the decks.

Bible-press. A hand rolling-board for cartridges, rocket, and port-fire cases.

Biddle, James, Commodore U.S.N., was born in Philadelphia in 1783, and entered the navy as midshipman in 1800. On his second cruise he was captured, with Capt. Bainbridge and the other officers and crew of the frigate "Philadelphia," by the Tripolitans, when that ship had struck

upon an unknown rock off the harbor. After an imprisonment of twenty months the captives were released. From that time until the war of 1812 Biddle was actively employed, and upon the breaking out of hostilities sailed in the sloop-of-war "Wasp," Capt. Jacob Jones, as first lieutenant. In October, 1812, the "Wasp" captured the British sloop-of-war "Frolic," of about equal force, this being the second of those famous naval combats of which Alison says, "No words can convey an adequate idea of the impression which the successive capture of these three frigates and two sloops made, not only in Great Britain and America, but over the whole civilized world." For gallantry on this occasion Lieut. Biddle was promoted, and placed in command of the sloop-of-war "Hornet." On this ship he was blockaded, with Commodore Decatur's squadron, in New London. Escaping the blockade he sailed for the East Indies, and off the island of Tristan d'Acunha encountered the British brig "Penguin," of equal force with the "Hornet." After an action of twenty-two minutes, in which the British ship lost a third of her officers and crew killed and wounded, the "Penguin" surrendered, but was so damaged that it was necessary to scuttle her. Biddle was severely wounded in the neck, and on his return to the United States was promoted to the rank of captain.

After the termination of the war he was constantly employed both in the ordinary routine of duty and also upon special services of more importance. In 1817 he took possession of Oregon Territory; in 1826 he signed a commercial treaty with Turkey. From 1838 to 1842 he was governor of the Naval Asylum, Philadelphia; and at his suggestion Secretary Paulding sent thither unemployed midshipmen for instruction, thus laying the foundation of a naval school. His last cruise was in command of a squadron in the East Indies. After exchanging the ratifications of the first treaty with China, in 1845, he touched at Japan, and was for a short time in command on the coast of California during the Mexican war. He died in Philadelphia in October, 1848.

Biddle, Nicholas, Captain U.S.N. An officer of the Colonial period. In command of the "Andrew Doria," of 14 guns, he displayed great activity, zeal, and intelligence. He made a number of prizes, and had at an early period raised the expectations of his friends to such a height that by many of them he was pronounced, and probably justly, not to have his superior in merit in the service. While cruising near the banks of Newfoundland he intercepted two transports, with 400 Highland troops on board, and was so successful in making captures that it is said he returned to the Delaware with five only of the men which composed his crew when he last left that river. He had distributed them among the captured, and received in return such of the crews of his prizes as were disposed to enter the Continental service. Capt. Biddle was appointed by Congress (June 6, 1776) to command one of the frigates then building in Philadelphia,—the "Randolph," of 32 guns. In February, 1777, she sailed on a cruise. In a few days a defect discovered in his masts induced him to put into Charleston, S. C., to repair them. Having refitted, he again sailed, and three days after being out he fell in with four vessels from Jamaica, one of them, the "True Briton," of 20 guns. Having captured the whole four, he returned with them to Charleston. This success gave such animation and encouragement to the State authorities of South Carolina that they fitted out four small vessels of war ("General Moultrie," "Fair American," "Polly," and "Notre Dame"), and placed them under the orders of Capt. Biddle. The immediate object was an attack upon the "Carrysfort," 32, the "Perseus," 24, the "Hinchinbrook," 16, and a privateer then cruising off Charleston. The bar of Charleston and adverse winds detained Capt. Biddle so long in Rebellion Road, that when he got to sea the British cruisers had disappeared. He captured a small schooner, and proceeded on his cruise till, between 8 and 9 o'clock at night of March 7, 1778, he fell in with the "Yarmouth," Capt. Vincent, of 64 guns. An action immediately commenced by a broadside from the "Randolph," and was maintained with great energy for twenty minutes or more, when the "Randolph" blew up, and the gallant Biddle, with 310 of his crew, perished in a blaze of glory. Four only of his men escaped, and they were picked up by the "Yarmouth" four days after the action, having supported themselves on a piece of the wreck, without anything to subsist on or quench their thirst excepting rain-water sucked from a blanket, which they had providently preserved.

Bid-hook. A small kind of boat-hook.

Biel-brief. The bottomry contract in Denmark, Sweden, and the north of Germany.

Bierling. An old name for a small galley.

Bifurcate. A river is said to bifurcate, or to form a fork, when it divides into two distinct branches, as at the heads of deltas and in fluvial basins.

Bight. The loop of a rope. A bend of the coast forming a wide-mouthed bay.

Bilander. A small merchant vessel with two masts, particularly distinguished by the form of her mainsail. It is bent to the whole length of the yard, hangs fore-and-aft, and is inclined at an angle of 45° to the horizon. Few vessels are now rigged in this manner, and the name is indiscriminately used.

Bilbo. An old term for a flexible kind of cutlass from Bilboa, where the best Spanish sword-blades were made.

Bilboa. A city and seaport of Spain, on the Nerva, 6 miles from its mouth. Lat. 40° 14′ 3″ N.; lon. 2° 56′ 5″ W. Bilboa has large rope-walks and docks for ship-building, and the anchors for the Spanish navy are here manufactured. Pop. 27,000.

Bilboes. Bolts and shackles used by the Spanish to confine the legs of their prisoners.

Bilge, or Bulge. The largest circumference of a cask. That part of the hull of a ship which approaches more nearly to a horizontal than to a vertical position. When a ship runs aground and receives an injury in this part of the hull she is said to be *bilged*. *To bilge*, in a figurative sense, means to be dropped from the service for failure to pass an examination.

BILGE-BOARD. The board covering the limbers.

BILGE-FEVER. A fever caused by the foulness of the hold.

BILGE-FREE. The situation of a cask when it

rests entirely on its beds, and the bilge is clear of everything.

Bilge-keel. A projection on the bilge of a vessel parallel with the keel. Used in flat-bottomed light-draft vessels to check the rolling.

Bilge-kelson. A timber extending fore-and-aft inside the bilge to strengthen the frame.

Bilge-plank. A strengthening plank at the bilge outside or inside.

Bilge-pump. A pump for clearing the hold of water. A small pump for drawing off the bilge-water when the ship is careened so that the water cannot make its way to the pump-well.

Bilge-water. Water that has collected in the bottom of a ship. It should be pumped out frequently, as it soon gives off an offensive odor and endangers the health of the crew.

Bilge-water Alarm. A bilge water gauge (which see), to which is an attachment that sounds an alarm when the water has risen to a certain height.

Bilge-water Discharge. An apparatus for discharging the bilge-water automatically; a tube from the pump-well through the stern, through which a current is induced by the vacuum which is formed at the rear orifice by the passage of the ship through the water.

Bilge-water Gauge. An apparatus to indicate the depth of water in the hold.

Bilge-ways. A series of timbers on either side of a vessel on the launching-ways, on which rests the cradle which supports the body of the ship in launching.

Bill. The end of a compass or knee-timber. The extremity of the arm of an anchor. A point of land, as Portland Bill. The point of a hook. See Fire-bill, Watch-Bill, Quarter-bill, and Station-bill.

Bill of Entry. A document containing an account of goods entered at a custom-house, either inward or outward.

Bill of Exchange. A note ordering the payment of a sum of money at a specified time and place, to a person therein appointed, in consideration of value received by the drawer at another.

The negotiation of inland bills of exchange, or those drawn by one person on another residing in the same country, may be effected either with or without the agency of bankers.

Usually there are three parties to a bill of exchange, viz., the drawer, the acceptor, and the indorser. When a party refuses to accept a bill drawn upon him, the holder's notary takes protest upon it, whereupon it is returned to the original drawer, who is liable in damages to the holder. Should the bill be accepted, but not paid when due, the holder's notary protests for non-payment. The acceptor is always liable to the holder; and the holder has recourse also against the drawer and the indorsers: the acceptor is liable only for the expenses of an action against himself, therefore the holder must make his election whom to sue. To preserve this recourse the earliest possible notice of the non-payment of a bill, to the drawer, and also to the indorsers, must be given. Every bill must be for payment of money only; but it does not affect the validity of a bill that its payment should depend upon some contingency, provided it be a contingency which must eventually happen, such as the death of a party now living. An alteration in the date, sum, or time of payment of a bill, will invalidate it; but it has been ruled that the words "or order" may be interlined in it. A bill may be accepted either *absolutely* or *with qualifications*. When accepted qualifiedly, it does not bind the acceptor till the contingency stipulated shall have happened. A bill may be also accepted partially, that is, it may be drawn for $200, but accepted only for $150. In all cases of conditional or partial acceptance, it is the duty of the holder, if he wish to preserve his recourse against the drawer and indorsers, to give notice to them of such partial or conditional acceptance. When a bill is made payable a certain time after sight, the holder must get the acceptor to note upon it the day when it was presented for his acceptance. Notice of the dishonoring of a bill by non-payment, or non-acceptance, should always be given to the immediate indorser, next day, through the post-office. Bills may be transferred either by delivery only or by indorsation and delivery. Bills payable to order require indorsation and delivery; but bills payable to bearer may be transferred by either mode. A special indorsement precludes the person in whose favor it is made from making a transfer. After the payment of a part, a bill may be indorsed over for the residue. If a bill is not presented for payment when due, the drawer and indorser will be exonerated from liability. If a bill fall due on Sunday, or a holiday, it must be presented for payment on the day preceding. The days of grace ought to have expired before a bill is presented for payment. No days of grace are allowed on bills payable on demand, or where no time of payment is expressed.

Bills of exchange may be drawn payable at sight, or so many days or months after date, or at *usance*, as it is termed; that is, the usual term allowed by the law of the place where the bill is payable. Most countries, however, allow a few days beyond the term of payment for settling or taking up a bill. These are called *days of grace*.

Bill of Freedom. A full pass for a neutral in time of war.

Bill of Health. A certificate properly authenticated by the consul, or other proper authority at any port, that the ship comes from a place where no contagious disorder prevails, and that none of the crew, at the time of her departure, were infected with any such distemper. Such constitutes a *clean* bill of health, in contradistinction to a *foul* bill.

Bill of Lading. A document signed by the master of a ship by which he acknowledges the receipt of a merchant's goods, and undertakes to deliver the same at the place to which they are consigned. Bills of lading are generally printed, leaving blanks to be filled in. Three sets are made out, one of which should be sent to the consignee by mail; the second transmitted to him by the vessel itself; and the third retained by the shipper. Bills of lading are transferable by indorsement. The indorsement and delivery of the bill of lading transfers the property in the goods from the time of such delivery. The *bona fide* holder of the bill, indorsed by the consignee, is entitled to the goods if he purchased the bill for a valuable consideration. Where there are several bills of lading, each is a contract in itself as to the holder of it, but the whole make only one contract as to the master and owners. If the several parts of the bill of lading

be indorsed to different persons, a competition may arise for the goods; and the rule generally is that if the equities be equal, the property passes by the bill first indorsed. See CHARTER PARTY.

Bill of Parcels. A written account, given by seller to buyer, of the quantities, sorts, and prices of goods bought.

Bill of Rights. In English law the declaration delivered by the two houses of Parliament to the Prince of Orange, February 13, 1688, at the period of his succession to the British throne, in which, after a full specification of various acts of James II. which were alleged to be illegal, the rights and privileges of the people were asserted. In the United States the term is applied to a declaration of the fundamental rights and liberties of the people which, in the shape of abstract propositions and elementary principles, forms part of the constitutions of many of the States.

Bill of Sale. See VESSELS, TITLE TO.

Bill of Sight. When an importer, from ignorance of the actual quantities or qualities of goods assigned to him, is unable to make an exact entry at the custom-house, he is allowed to make an entry by bill of sight,—that is, according to the best description that can be given. On this, the collector or comptroller is empowered to grant warrant for the landing of the goods, the importer being bound to make, within three days afterwards, a perfect entry, and either to pay down the duties or to warehouse the goods.

Bill of Store. A license granted by the custom-officers for carrying, free of duty, such stores as may be necessary for a voyage. Returned goods may be entered by a bill of store.

Bill-boards. Projections of oak plank secured to the bow of the ship abaft the cat-heads for the fluke of the anchor to rest on.

Billet. The tin tag hung above the hammock-hook on which the number is painted. An individual's situation or employment. A memorandum of the various duties and stations of a seaman, which is given to him when he first comes on board for duty.

Billet-head. A scroll-head. A round piece of wood fitted to the bow or stern of a whale-boat, around which the line is veered when the whale is struck.

Billet-wood. Small wood used for dunnage.

Bill-fish. See GAR-FISH.

Billow. A great wave or surge of the sea.

Bindings. A general term for beams, knees, clamps, transoms, and other connecting parts of a vessel.

Binding Strakes. Thick planks on the decks, running just outside the line of hatches, jogged down over the beams and ledges. The principal strakes of plank in a vessel, especially the sheer-strake and wales.

Binge. To rinse a cask.

Bingid. An old term for locker.

Bink. See BENK.

Binnacle. A case or box to contain the compass. It is fitted with a lamp to light up the card at night.

BINNACLE-LIGHT. The lamp used in a binnacle.

Binocle. A telescope adapted to the use of both eyes.

BINOCULAR TELESCOPE. A two-barreled telescope invented by Galileo in 1617, though the invention is sometimes credited to Schyrleus de Rheita.

Bior-linn. A very old word for boat.

Bird's-foot Sea-star. The *Palmipes membranaceous*, one of the *Arteriadæ*, with a flat, thin, pentagonal body, of a bright scarlet color.

Bird's-nest. A round top at a mast-head for a look-out station. A smaller crow's-nest. Chiefly used in whalers, where a constant look-out is kept for whales. See EDIBLE BIRD'S-NEST.

Bireme. In Roman antiquity, a vessel with two rows of oars.

Birt. A kind of turbot.

Birth-marks. Marks denoting the depth to which a ship may be loaded with safety.

Biscuit. Hard bread for naval use.

Bishop. A name of the great northern diver (*Colymbus glacialis*).

Bismer. A name of the stickleback (*Gasterosteus spinachia*).

Bissextile (Lat. *bis*, twice, and *sextus*, sixth). "*Leap-year.*" In the Julian calendar every fourth year consisted of 366 days. The additional day was inserted after the 24th of February, which in the Roman calendar was called "the *sixth* day before the Calends of March," and being reckoned twice over every fourth year it was called *bissextus dies*, and the year was named *Bissextilis*.

Bit. A *short bit* is equal to 12½ cents, a *long bit* to 25 cents. The term arose from the cutting of Spanish silver coins into "bits." It is still in use in the west, especially in California.

Bite. The hold which the short end of a lever has under the object to be lifted. When the fluke of an anchor enters the ground it is said to *bite*.

Bitt. To take a turn with the cable around the head of the bitts. *To double bitt* or *to weather-bitt* the cable is to take an extra turn around the head of the bitts.

Bitter. Any turn of the cable around the bitts. Hence a ship is *brought to a bitter* when the chain has run out to that point.

Bitter-end. The last end. The end of the cable not bent to the anchor.

Bitt-head. The upper part of the bitts.

Bitt-pin. A large iron pin in the head of the bitts to prevent the chain from slipping off in veering.

Bitts. Vertical timbers projecting above the decks. The bitts for the cable are circular, and are coated with iron. There are generally two pairs of them, the after pair being used for the sheet-chains. The *topsail-sheet bitts* are fixed near to, and forward of, the masts.

Bitt-stopper. A stopper used at the bitts for securing the cable. See STOPPER.

Bize. A cold wind from the summits of the Pyrenees.

Blackamoor. A thoroughly black negro.

Black-and-tan. An epithet applied to a mulatto.

Black-bird Catching. The slave-trade.

Black-birds. Negroes.

Black-fish. A name applied to many different species of cetaceans.

Black-head. The pewitt-gull (*Larus ridibundus*).

Black-hole. A place of solitary confinement.

Black Indies. Newcastle, Sunderland, and Shields.

Blacking down. The operation of tarring and blacking the rigging.

Black-jack. A piratical-looking individual. The ensign of a pirate.

Black-list. A record of misdemeanors formerly kept by officers for their private use. The list of men who are detailed for extra duty as a punishment.

Black Ship. A term applied to a ship built in India, of teak.

Black South-easter. A well-known violent wind at the Cape of Good Hope, in which vapory clouds, called the Devil's Table-cloth, appear on Table Mountain.

Black Squall. This squall may be principally ascribed to the heated state of the atmosphere near the land.

Black-strake. The range of planks just above the wales.

Black-strap. Bad port wine. The dark wines of the Mediterranean.

Black-tang. The sea-weed *Fucus vesicolosus*, or tangle.

Blackwall-hitch. A hitch made by putting the bight of a rope over the back of a hook, and jamming the end under the standing part. It is used principally for the hauling part of a tackle when there is not sufficient length to make a cat's-paw.

Black Whale. A name for the right whale of the south seas (*Balæna australis*).

Black Vomit. A copious vomiting of dark-colored matter, or the substance so discharged; one of the most fatal symptoms in yellow fever.

Blad. A term used on the northern coasts of Great Britain for a squall accompanied by rain.

Bladder-fish. A name for the tetrodon. See Balloon-fish.

Blade. The cutting part of a sword or cutlass. The part of the arm of an anchor prepared to receive the palm. One of the projecting arms of a screw-propeller. The part of an oar which is immersed in the water in rowing.

Blae, or Blea. The alburnum or sap-wood of timber.

Blake, George S., Commodore U.S.N. Born in Massachusetts. Appointed midshipman, April 23, 1818; commissioned as lieutenant, March 31, 1827; West India Squadron, 1829; survey of Narragansett Bay, 1831–33; navy-yard, Philadelphia, 1834; coast survey, 1837–48; navy-yard, Philadelphia, 1848; commissioned as commander, February 27, 1847; fleet-captain, Mediterranean Squadron, 1850–52; bureau construction, 1853–55; commissioned as captain, September 14, 1855; special duty, 1856–57; superintendent Naval Academy, 1858–65; commissioned as commodore, July 16, 1862; light-house inspector, 1866–69; died at Longwood, Mo., June 24, 1871.

Blake, Homer C., Commodore U.S.N. Born in New York, 1822. Appointed midshipman, March 2, 1840; frigate "Constellation," East India Squadron, 1841–43; sloop "Preble," coast of Africa, 1843–45; naval school, 1846; sloop "Preble," Pacific Squadron, 1846–48.

Promoted to passed midshipman, July 11, 1846; receiving-ship, New York, 1849–50; frigate "Raritan," Pacific Squadron, 1850–52; receiving-ship, Boston, 1853–56.

Commissioned as lieutenant, September 14, 1855; frigate "St. Lawrence," Brazil Squadron, 1857–59; frigate "Sabine," Home Squadron, 1861–62.

Commissioned as lieutenant-commander, July 16, 1862; commanding steamer "Hatteras," Western Gulf Blockading Squadron, 1862–63. On January 11, 1863, the "Hatteras," while at anchor off Galveston, Texas, was ordered by signal from the "Brooklyn," flag-ship of the division blockading Galveston, to chase a sail to the southward and eastward. Commander Blake at once obeyed the signal, and steamed at all speed in the direction indicated, and rapidly gained upon the suspicious vessel, which was discovered to be a steamer. When within about four miles of the vessel, it was observed that she had ceased to steam, and was lying "broadside on," awaiting the approach of the "Hatteras." When at about the distance of seventy-five yards, Commander Blake hailed, and asked, "What steamer is that?" The reply was, "Her Britannic Majesty's ship 'Vixen.'" Commander Blake ordered a boat to be sent aboard, but before the order could be obeyed, the commander of the strange craft hailed and said, "We are the Confederate steamer 'Alabama,'" which was accompanied by a broadside. The "Hatteras" returned the fire almost instantly, and steamed directly for the "Alabama" in the hope to carry her by boarding; but the attempt was defeated by the commander of the piratical craft. At length a shell entered the hold of the "Hatteras," and at the same instant another shell passed through the "sick bay," exploding in an adjoining compartment, and setting fire to the vessel. Still another shell entered the cylinder, filling the engine-room and deck with steam, and depriving Commander Blake of all power to manœuvre his vessel or work the pumps, upon which the reduction of the fire depended. With the vessel on fire in two places and her engine disabled, Commander Blake felt that it was useless to sacrifice the lives of his command, and so ordered a lee gun to be fired. The "Alabama" then asked if assistance was desired, to which an affirmative answer was given. After considerable delay, the "Alabama" sent assistance, and the crew and officers of the "Hatteras" were transferred to the "Alabama." Ten minutes after the crew left her decks, the "Hatteras" went down bow first. The battery upon the "Alabama" brought into action against the "Hatteras" numbered seven guns, consisting of four long 32-pounders, one 100-pounder rifled gun, one 68-pounder, and one 24-pounder rifled gun. The guns used in the action by the "Hatteras" were two short 32-pounders, one 30-pounder rifled Parrot, and one 20-pounder rifled gun. The action was fought at a distance of about seventy-five yards. The crew of the "Hatteras" was landed at Port Royal, Jamaica, and was with all dispatch conveyed from Port Royal to Kingston, under the guidance of the American vice-consul, John N. Camp. Commanding steamer "Utah," North Atlantic Blockading Squadron, 1863–65; shelled three divisions of rebel army at Malvern Hill, 1864; assisted to repulse an attack of the rebels on the right of the army of the James, October, 1864; engagement with rebel batteries at Trent Reach, James River, 1865; navy-yard, Portsmouth, N. H., 1866–68.

Commissioned as commander, March 3, 1866;

commanding steam-sloop "Swatara," European Squadron, 1868–69; commanding steam-sloop "Alaska," Asiatic Fleet, 1870–72.

Commissioned as captain, May 25, 1871; commanding naval rendezvous, New York, 1873–78.

Promoted to commodore, 1880, and died in February of that year.

Blake, Robert. Born at Bridgewater, in Somersetshire, in 1599. In the annals of the Commonwealth of England few names stand higher than that of this bold seaman. He was appointed for his pre-eminent ability and singular intrepidity "General of the Sea" in 1649, yet he was fifty years of age before he became a sailor. One of his earliest exploits was the defeat of Prince Rupert's fleet on the Tagus in 1651. In 1652 he gained a victory over Van Tromp after a running fight of three days. The piratical Tunisians had no mercy at his hands. His greatest achievement was at Santa Cruz, in 1657. The Spaniards, with several treasure-ships, were, as they supposed, impregnable within the fortified harbor; but Blake dashed in, faced the fire of the castle, silenced the smaller redoubts, and, seizing the richly-laden galleons, sailed out without the loss of a single ship. It was truly said of him that "it would have been hard to find the thing which Blake dared not do." Died at Plymouth, August 17, 1657.

Blakeley, Johnston, Captain U.S.N. Born at Seaford, county Down, Ireland, October, 1781; lost at sea in 1814. His father emigrated to Wilmington, N. C. The members of his family dying one by one, he was left alone in the world, and had also the misfortune to lose the little remnant of their property. A friend gave him an education, and procured for him a midshipman's warrant, February 5, 1800. Made lieutenant, February 10, 1807; master-commander, July 24, 1813; captain, November 24, 1814. In 1813 he commanded the brig "Enterprise," and did good service in protecting our coasting trade. In August he was appointed to "The Wasp," in which, June 28, 1814, he captured, after an action of nineteen minutes, in latitude 48° 36′ north, H. B. M. ship "Reindeer," which he was obliged to burn. This severe action showed the manifest superiority of American gunnery. The "Reindeer" made three attempts to board, in the last of which her gallant commander was slain. For this exploit Congress voted him a gold medal with suitable devices. September 1, 1814, in a severe action with the brig "Avon," he compelled her to strike; but the approach of another enemy prevented his taking possession of her. "The Wasp" was afterward spoken off the Western Isles, and on September 21 captured the brig "Atalanta," which arrived safely in Savannah, and brought the last direct intelligence ever received from "The Wasp." Being heavily armed and sparred, and very deep-waisted, she probably foundered in a gale. His only child, a daughter, was educated at the expense of the State of North Carolina.

Blank. The white mark in the centre of a target. See Point-blank and Cartridge.

Blanket. The layer of blubber under the skin of a whale.

Blare. To bellow or roar vehemently. A mixture of hair and tar, used for calking the seams of boats.

Blarney. Idle discourse; obsequious flattery.

Blashy. Watery or dirty; as, a *blashy* day. In parlance, trifling, flimsy.

Blast. A sudden and violent gust of wind.

Blast-engine. An apparatus for urging the fire of a furnace. A ventilating machine to draw off the foul air from a ship's hold and force fresh air into it.

Blast-furnace. A furnace in which the supply of air is furnished by a pneumatic apparatus.

Blast-pipe. A pipe to convey steam into the smoke-stack to aid the draft.

Blather. Thin mud; idle nonsense.

Blay. A name of the bleak (which see).

Blazer. A term applied to a mortar-vessel, from the great emission of flame when the mortar is fired.

Blazing-star. A popular name for a comet.

Bleak. The *Leuciscus alburnus* of naturalists, and the fresh-water sprat of Izaak Walton. The name of this fish is from the Anglo-Saxon *blican*, owing to its shining whiteness,—its lustrous scales having long been used in the manufacture of false pearls.

Bleed the Buoys. To let the water out.

Bleeding the Monkey. The monkey was a tall pyramidal kid or bucket, which conveyed the grog from the grog-tub to the mess,—stealing from this *in transitu* was termed *bleeding the monkey*.

Blenny. A small acanthopterygious fish (*Blennius*).

Blether-head. A blockhead.

Blethering. Talking idle nonsense; insolent prate.

Blind. A name on the west coast of Scotland for the pogge, or miller's-thumb (*Cottus cataphractus*).

Blind-bucklers. Those fitted for the hawse-holes, which have no aperture for the cable, and used at sea to prevent the water coming in.

Blind-harbor. One, the entrance of which is so shut in as not readily to be perceived.

Blind-rock. One lying just under the surface of the water, so as not to be visible in calms.

Blind-shell. A shell with a large fuse-hole and filled with composition, to indicate the range at night. A shell which does not explode.

Blind-stakes. A sort of river-weir.

Blink. A term in Greenland for *iceberg*.

Blink of the Ice. The reflection of an iceberg in the air above it.

Blirt. A gust of wind and rain.

Bloat. To dry by smoke; a method applied almost exclusively to cure herrings. *Bloated* is also applied to any half-dried fish.

Bloater. A herring dried by smoke.

Blocco. Paper and hair used in calking a vessel's bottom.

Block. The large piece of timber out of which a figure-head is carved. One of the transverse timbers on which a ship is built or placed for repairs. A flat oval piece of wood containing one or more sheaves. *Blocks* are used either to gain an increase of power or to give a rope a fair lead. A block consists of the *shell*, *sheave*, *pin*, and *strap*. The *shell* is the frame or outside part, and is made of ash or elm. In the *morticed* block the shell is composed of but one piece of wood; in the *made* block it consists of two or more pieces pinned together, the two principal outside pieces being called *cheeks*. On the sides and at each end of the shell is cut a single or a double *score*,

which allows the strap to set snugly on the block and prevents it from slipping off. The size of a block is determined by the length of the shell. The *sheave* is the wheel over which the rope runs, and is made of metal or lignum-vitæ. It has a hole in the centre to receive the *pin*. In a lignum-vitæ sheave this hole is generally *bouched*, or lined with metal, to decrease the friction and to protect the sheave from chafe. *Friction rollers* are sometimes inserted in the sheave when it is not to be subjected to a very great strain. Around the circumference of the sheave a *groove* is cut, which serves to retain the rope in place and prevent it from chafing against the shell. The *pin* is the bolt through the shell and sheave on which the latter revolves. The *strap* is a rope which encircles the shell, and by which it is attached to its particular place. The *swallow* is the aperture through which the rope reeves. The *hook* is attached to the strap, and is prevented from chafing by means of a *thimble*. Two of these thimbles joined together are called *lock-thimbles*. The *breech* is the end of the block farthest from the hook. The *becket* is a small grommet to which the standing part of the fall is made fast. Blocks are *single*, *double*, *threefold*, or *fourfold*, according to the number of their sheaves, and vary in size from four to thirty inches. Iron blocks, and wooden blocks with iron straps, are now coming more generally into use. Under the general head of blocks come hearts, collar-hearts, dead-eyes, bull's-eyes, wooden thimbles, fair-leaders, euphroes, cleats, cavils, wooden belaying-pins, wooden rollers, chocks, toggles, travelers, wooden hanks, hoops, trucks, etc. (which see under their proper heads). Blocks receive their names from some peculiarity of form, from the position they occupy, or from the rope leading through them. For description of blocks, see under the following heads: BEE-BLOCKS, or BEES, BRAIL-, CAT-, CHEEK-, CLEW-GARNET-, CLEWLINE-, CHUNK-, CLUMP-, D-, DASHER-, DOUBLE-, FIDDLE-, FISH-, FIXED-, FLY-, GIRT-LINE-, GIN-, GUN-TACKLE-, HANGING-, JACK-, JEER-, JEWEL-, LONG-TACKLE-, MONKEY-, NINE-PIN-, NIB-, PATENT-, QUARTER-, RUNNING-, RACK-, SHOE-, SPAN-, SPRING-, SINGLE-, SHOULDER-, SISTER-, SECRET-, STANDING-, SNATCH-, TELEGRAPH-, TREBLE-, TAIL-, TOP-, TYE-, VIOL-, and WARPING-BLOCK.

Blockade. The shutting up of a port or ports by troops or ships, so as to prevent egress or ingress, or the reception of supplies. To constitute a blockade the investing power must be able to apply its force to every point of practicable access, so as to render it dangerous to attempt to enter or depart. See INTERNATIONAL LAW.

Block-and-block. An expression denoting that the two blocks of a tackle have been drawn together, and that the tackle is inoperative. Synonymous with *two-blocks* and *chock-a-block*.

Blockmaker. A manufacturer of blocks.

Blockmaking Machine. The first set of machinery for making blocks was invented by Brunel early in the present century, and was set up at Portsmouth, England, in 1808. The saving in the cost of blocks is about $100,000 per annum.

Blood-sucker. A skulker; one who throws his proportion of work on the shoulders of his shipmates.

Bloody. A slang superlative, principally used by Englishmen.

Bloody Flag. A large red flag.

Bloom. A warm blast of wind. A mass of iron which has been deprived of its dross by squeezing or shingling.

Blore. An old word for a stiff gale.

Blouse. A light single-breasted sack-coat.

Blout. A name to denote the sudden breaking up of a gale.

Blow. A gale of wind. The moving of the air; as, the winds *blow*. A violent stroke of the hand, or any instrument. To eject wind from the mouth; hence the term as applied to the breathing of cetaceans,—the air expelled from the lungs, being heavily charged with moisture, condenses on contact with the atmosphere, and appears like a column of steam. *There she blows!* the cry of the look-out when a whale is sighted.

Blowe. An old word for *scold;* hence the term "blowing-up" for a reprimand.

Blow-holes. The nostrils of the cetaceans. In some species they are slits placed side by side; in others there is but one opening.

Blow Home. The wind does not *blow home* when its course is diverted by a chain of mountains or other obstacle.

Blowing Great Guns. An expression to denote a violent gale.

Blowing Off. The operation of ejecting from the boiler the water which has become saturated with salt, to prevent the formation of scale.

Blowing the Grampus. Throwing water over a sleeper on watch.

Blowing Through. The operation of clearing the valves, cylinders, and condenser of air before starting the engine.

Blowing Weather. A term to signify a continuance of strong gales.

Blow-off Pipe. A pipe leading from the bottom of the boiler to convey the sediment overboard.

Blown. Half-dried; applied to cod and herrings.

Blown Itself Out. A gale is said to have *blown itself out* when its energy is expended.

Blow-out. A jollification or spree.

Blow-pipe. An engine of offense used by the Araucanians and Borneans, and with the latter termed *sumpitan:* the poisoned arrow, *sumpit*, will wound at the distance of 140 or more yards. The arrow is forced through by the forcible and sudden exertion of the lungs. A wafer can be hit at 30 yards to a certainty, and small birds are unerringly stunned at 30 yards by pellets of clay.

Blow the Gaff. To reveal a secret; to expose or inform against a person.

Blow-through Valve. A valve admitting steam into the cylinder and condenser, in order to clear them of air and water before starting the engine.

Blow Up. To abuse angrily.

Blow-valve. The snifting-valve. The valve which permits the steam to escape on *blowing through*.

Blubber. The layer of fat in whales between the skin and the flesh, varying from 10 to 20 inches in thickness, which is flinched or peeled off, and boiled for oil. See SEA-BLUBBER.

Blubber-forks and Choppers. The implements with which blubber is "made off," or cut for stowing away.

Blubber-guy. A large rope stretched from the main- to the foremast-head of whalers, to which the speck-falls are attached for the operation of flensing.

Blue. *Till all's blue:* carried to the utmost,—a phrase borrowed from the idea of a vessel making out of port, and getting into blue water. *To look blue*, to be surprised, disappointed, or taken aback, with a countenance expressive of displeasure.

Blue-book. The name by which the book containing the regulations for the navy is known; also, a book containing the names of all persons in the employ of the United States government, with the amount of their pay.

Blue-jackets. The seamen as distinguished from the marines.

Blue-light. A pyrotechnical preparation for signals by night. Also called Bengal light.

Blue-lightism. Affected sanctimoniousness.

Blue Moon. An indefinite period.

Blue-nose. A native of Nova Scotia, or a Nova Scotian vessel.

Blue Peter. A flag with a blue ground and a white centre, which, when hoisted at the fore, denotes that the ship is ready to sail. It corresponds to the cornet in the navy.

Blue Pigeon. A nickname for the sounding lead.

Blue Water. The open ocean.

Bluff. An abrupt highland, projecting almost perpendicularly into the sea, and presenting a bold front, rather rounded than cliffy in outline.

Bluff-bowed. Applied to a vessel that has broad and flat bows,—that is, full and square formed; the opposite of lean.

Bluff-headed. Built with the stem nearly straight up-and-down.

Blunderbuss. A short fire-arm with a large bore and wide mouth.

Blunk. A sudden squall.

Blustrous. Stormy.

Boadnash. Buckhemshein coins of Barbary.

Boanga. A Malay piratical vessel impelled by oars.

Board. A piece of sawed timber relatively broad and thin. The terms *board* and *plank* are often indiscriminately used. See Plank.

The deck or interior of a vessel. To *board* a vessel is to enter either in a friendly or a hostile manner.

The side of a vessel. *Overboard*, over the side, in the water. *In-board*, inside, or farther from the side. *Out-board*, nearer to the side. *Board to board*, or *board and board*, side by side.

The stretch which a ship makes on one tack in beating to windward. To make a *good board*, to lose little or nothing to leeward. To make *short boards*, to tack frequently. When a ship luffs up into the wind until the headway has nearly ceased, and is then made to pay off on the same tack, she is said to make a *half-board;* with smooth water and a good working breeze a ship can eat her way up to windward in this manner. When the vessel goes astern she makes a *stern-board.* It is advisable in this case not to put the helm hard over, as great strain would be brought on the rudder.

A word applied to certain individuals in a collective capacity who are appointed by competent authority for the management of some public office or trust; as, The Light-house Board (which see); or to perform certain specified duties; as, The Board for the Examination of Officers for Promotion and Retirement (which see), and The Board of Inspection (which see). There are also boards convened from time to time for the purpose of collating facts and expressing opinions, of an advisory character, respecting the matters submitted to them by the convening authority.

Board, The Academic. The collective designation of the heads of the departments of instruction at the Naval Academy.

Boarders. The men detailed to attack the enemy by boarding. They are armed with pistols and cutlasses, and are led by the executive-officer. They are summoned by verbal order and by the springing of the rattle, and assemble in the part of the ship designated, keeping under cover as much as possible.

Boarding. The act of entering a vessel, either with hostile intent or in a friendly manner.

In boarding with hostile intent the way is cleared for the boarders by a brisk fire from the rifles and machine-guns, by hand-grenades, and by streams of hot water from the steam-pumps. The great guns are depressed, and, at the order *board the enemy*, the boarders gain the enemy's deck as quickly as possible, and use every endeavor to clear the decks by disabling or driving the men below. While the boarders are absent from their guns, the remaining men keep up as rapid a fire as is possible under the circumstances, and the ports of the guns not in use are closed.

If the boarders are driven back they rally on the flanks of the riflemen, taking care to get quickly out of the line of their fire.

If the enemy manifest a disposition to board, the marines and riflemen are called away, and open fire from favorable positions, and the great guns, howitzers, and machine-guns are brought to bear on the enemy's boarders. Every effort should be made to shake or disperse them, and, if not successful, it will be necessary, before the enemy closes, to call *all hands repel boarders.* The marines and riflemen form on the side which is engaged, opposite to the point where the enemy is likely to attempt to enter, the boarders being on the flank and in the rear. The reserves are posted in the rear of the flanks of the riflemen. If the enemy gain a footing he must be charged in force, as the necessity for driving him back at once is absolute. Rallying-points should be designated, and barricades should be constructed. The shaft of a paddle-wheel vessel, or a gun run in to a taut breeching, affords a good shelter.

When at close quarters the sword is a more effective weapon than the rifle and bayonet, in which case the bayonets are unfixed and used as swords.

When there is a possibility of being boarded, boarding-nettings are got up, and the torpedoes are got ready for use.

Boarding a Vessel under Sail. Board to leeward, and do not go alongside while she has stern-way on. See that the line by which the boat rides is long enough to permit the boat to rise and fall with the sea. The line should not be belayed, but kept in hand ready for shipping. Be careful that the masts or oars do not take under the quarter-boats or chains.

Boarding a Wreck. The chief dangers to

be apprehended in boarding a wreck are the collision of the boat with the ship, or with floating spars, and the swamping of the boat alongside. The greater violence of the sea on the weather side makes it preferable to board to leeward. The dangers to be guarded against in boarding on the lee side are the falling of the masts and collision with floating spars.

The large life-boats that go off to wrecks anchor to windward and veer down, care being taken to prevent actual contact.

BOARDING-BOOK. A book in which are entered the particulars in regard to every ship boarded. It is not taken on board men-of-war, but the particulars are afterwards registered.

BOARDING-NETTINGS. A network of wire ropes or hemp ropes soaked in tar and sanded, to prevent boarders from entering a ship. The lower edge is made fast to the rail, and the upper edge triced up by whips or stopped to the ridge-rope.

BOARDING-PIKE. A defensive lance against boarders.

BOARD IN THE SMOKE. A figurative expression, signifying to create confusion or enthusiasm, and then to endeavor to attain one's object before the effect has passed away. The expression arose from the custom of delivering a broadside as the boarders were thrown upon the enemy's decks.

Boardling (*Eng.*). A flippant understrapper of the admiralty or navy-board.

Board of Trade. See TRADE, BOARD OF.

Boat. A small open vessel, propelled by oars or sails, and sometimes by steam. The name is also applied to large river-craft propelled entirely by steam, and also to a vessel having no motive power of its own; as, a *canal-boat*. Boats are built of various materials; as, wood, iron, paper, etc. Wood is used for boats for ordinary purposes, iron for heavy boats, and wood or paper for racing-boats.

The frame of a *carvel-built* boat generally consists of a floor and two futtocks, and the planks do not overlap, but make flush seams, which are calked. In the *clinker-built* boat the lower edge of each plank laps over the upper edge of the one next below. A *diagonal-built* boat is one in which the outer skin consists of two layers of planking at right angles to each other, and making an angle of 45° with the keel.

Boats are square-sterned, or sharp at both ends; in the latter case they are called whale-boats. *Single-banked* boats have one oarsman to each thwart, and a *double-banked* boat has two. *Oars* are double-banked when each oar is pulled by two men.

The boats in use in the navy are as follows: steam-launches, steam-cutters, launches, cutters, whale-boats, dingys, barges, and gigs. For a description of these various boats, with their various rigs, see under the proper heads. See LIFE-BOATS.

Up boats, the order to hoist all the boats. *To secure a boat for sea*, to rig in the davits, and pass the gripes around the boat and strong-back. *To call away a boat*, to pass the word for the crew to man their boat. *To trim boat*, to so dispose the weight in her that she shall float upright. *To bail a boat*, to throw out the water that may be in her. *To moor a boat*, to secure it at a buoy or wharf. *To wind a boat*, to slue it around end for end. *To man a boat*, to send the crew in it to manage it. *To boat the oars*, to place them on the thwarts fore-and-aft ready for use.

Boats, Equipment of.

RUNNING-BOATS, or boats which do the ordinary duty of a ship, are supplied with oars, boat-hooks, fenders, breaker, anchor, colors, cushions, painter, etc. Masts, sails, compass, and awnings will be carried as ordered.

ARMED BOATS are equipped according to the nature of the service they are to perform.

DISTANT SERVICE. The boat is supplied with provisions, fuel, cooking utensils, ammunition, arms and accoutrements, tools and articles for repairing damages, boat-gear, means of making signals, and a medical outfit. If a gun is carried, ammunition and implements for the service of the piece afloat are supplied.

CUTTING OUT VESSELS, OR CONTENDING WITH OTHER BOATS. The boat is supplied with ammunition, arms and accoutrements, tools and articles for repairing damages, medical outfit, means of making signals, a small quantity of provisions, and as many men as can be carried without undue crowding. If a gun is carried, ammunition and implements for the service of the piece afloat are supplied. See CUTTING OUT.

LANDING WHERE LIKELY TO BE OPPOSED. The boat is supplied with ammunition, arms, and accoutrements, tools and articles for repairing damages, and a small quantity of provisions. No masts or sails are carried. If a gun is carried, ammunition and implements for the service of the piece afloat and ashore are supplied. For more minute details, see ORDNANCE INSTRUCTIONS, 1880.

Boats, Management of.

UNDER OARS. Before leaving the ship see that she is properly equipped for the service on which she may be going. Do not shove off during stern-way. Trim the boat. Keep the weights amidships. Do not allow the men to stand up in the boat, or to sit on the gunwale. Sand is much heavier when wet than when dry, therefore do not overload the boat with it. Water in breakers is safest for ballast; iron or sand stows better, but in the event of a capsize would sink the boat. A loaded boat holds her way longer than when light. Make due allowance for the tide; a little judgment may save a long pull. Keep clear of a vessel with stern-way on. Keep a boat bows-on to a heavy sea. A boat may ride out a heavy gale by lashing the spars, sails, etc., together and riding to leeward of them. See BOARDING, KEDGING, ROWING, SURF, SALUTES, TOWING, and WARPING.

UNDER SAIL. When the ship is not head to wind, pull well clear of the ship before making sail. Hoist the jib before the foresail, that the mast-head may not be dragged aft. Do not belay the sheets, but keep them in hand. Running before a stiff breeze, reduce sail before luffing up. Running dead before the wind in a light boat is dangerous; it is safer to run half the distance with the wind on one quarter, and then bring the wind on the other quarter. In a moderate squall ease the sheets; in a hard squall luff up and lower the sails. If there be any doubt about weathering a point, go about at once. If there be any doubt about going around, have an oar ready to leeward. If the men are sitting to windward, make them sit amidships on

passing to leeward of a ship. In a stiff breeze get the masts down before going alongside of a ship.

BOATABLE. Navigable for boats.

BOAT-CHOCKS. Pieces of wood on which boats rest when stowed on deck.

BOAT-CLOAK. A mantle for the use of officers in a boat.

BOAT-DAVIT. The name applied to the timbers which project over the side or stern of a vessel, and to which the boats are hoisted.

BOAT-DRILL. The objects of boat-drill are as follows: *first*, to accustom the men to rowing and to the handling of boats under sail (see MANAGEMENT OF BOATS); *second*, to instruct the men in the manipulation of boat-guns (see HOWITZER); *third*, to familiarize the men with their duties in providing articles for the equipment of boats (see EQUIPMENT OF BOATS); *fourth*, to familiarize the officers and quartermasters with making and reading signals (see SIGNALS); and, *fifth*, to familiarize the officers with the principles of fleet tactics. The tactics for boats under sail are the same as for vessels under canvas, and when the boats are under oars they conform to the rules laid down for the regulation of vessels under steam. See NAVAL TACTICS.

BOAT-FAST. The rope by which a boat is made fast.

BOAT-GEAR. The rigging and furniture of a boat.

BOAT-HIRE. Expenses for the use of shore-boats.

BOAT-HOOK. A staff fitted with an iron or brass head, used in a boat when alongside of a wharf or a ship.

BOATILA. A narrow-sterned, flat-bottomed boat of the Gulf of Manar.

BOATING. Transporting men, munitions, or goods by boats.

BOAT-KEEPER. One of the boat's crew who remains in charge during the absence of the others.

BOAT-LINE. See BOAT-ROPE.

BOAT-ROPE. A rope by which a boat is towed. A rope fitted to a boat to assist in managing it when lowered in a sea-way.

BOAT'S-CREW. The men detailed for duty in a particular boat.

BOAT'S-GRIPES. Lashings for securing davit-boats at sea.

BOAT-SKIDS. Skids to keep a boat clear of the ship's side in hoisting or lowering.

Boatswain (Fr. *maitre d'équipage*). Formerly pronounced and sometimes written bote-son, or boat's-son, and bo'sun, is in the Spanish and Portuguese navies styled "Master of the Canvass." The title is said to be derived from *bat*, a boat, and *swân*, a swain, or servant. His symbol of office—the silver call, or whistle—was once the proud insignia of the Lord High Admiral of England, and the decorative appendage of the Admirals of the Fleet, who wore it suspended from a golden chain, and with it "were wont to cheer their men in battle." The duties of a boatswain are constant and fatiguing; his station is the forecastle, whence he can direct the men aloft. He pipes "all hands" for general work, and his mates repeat the call on their respective decks. Boatswains in the United States navy are warrant-officers, and their principal duties are as follows:

The boatswain is to be generally upon deck during the day, and at all times when any duty shall require all hands to be employed. He is with his mates to see that the men go quickly upon deck when called, and that they perform their duty with alacrity. He will every day at 7.30 A.M., and at such other times as directed, examine the rigging, and report to the officer of the deck the state in which he finds it. He is to be careful that the anchors, booms, and boats are properly secured, and is to have ready a sufficient number of mats, plats, nippers, points, and gaskets, that no delay may be experienced. He will be careful that the masts of the ship are not crippled or strained in setting up the stays and rigging, and that they retain the same angle with the keel after the stays and rigging are set up that they had when they were only wedged. He is to see when junk is worked up that every part is applied to the purposes ordered. When preparing for battle, he is to see that everything necessary for repairing the rigging is in place.

BOATSWAIN-BIRD (*Phæton æthereus*). A tropical bird, so called from the whistling noise it makes. It has two long feathers in its tail, called the marling-spike.

BOATSWAIN-CAPTAIN. A term applied to a commanding officer who pays great attention to the minor details which are generally attended to by the boatswain.

BOATSWAIN'S MATE. The chief petty officer of the watch. He passes all the orders of the officer of the watch, and uses his call as circumstances require.

BOATSWAIN'S STORE-ROOM. An apartment for the boatswain's stores.

Boat the Oars. To place the oars fore-and-aft on the thwarts ready for use.

Bob. The ball or balance-weight of a clock's pendulum; the weight attached to the plumb-line. To fish. A knot of worms on a string, used in fishing for eels; also colloquially, it means a berth. *Shift your bob*, to move about, to dodge. *Bear a bob*, make haste, be brisk.

Bobbery. A disturbance, row, or squabble; a term much used in the East Indies and China.

Bobbing. A particular method of fishing for eels.

Bobbing About. Heaving and setting without making any way.

Bobble. The state of waves when dashing about without any regular set or direction, as in cross tides or currents.

Bobstay. A rope or chain extending from the bowsprit to the cutwater. Its use is to counteract the strain of the head-stays. The bowsprit is also fortified by shrouds from the bows on each side, which are all very necessary, as the foremast and the upper spars on the mainmast are stayed and greatly supported by the bowsprit.

BOBSTAY-COLLARS. These are made with large rope, and an eye spliced in each end; they are secured round the bowsprit, on the upper side, with a rose lashing. They are almost entirely superseded by iron bands.

BOBSTAY-HOLES. Those cut through the forepart of the knee of the head, between the cheeks, for the admission of the bobstay; they are not much used now, as chain bobstays are almost universal, which are secured to plates by shackles.

BOBSTAY-PIECE. A piece of timber to which the bobstays are secured.

Bobstay-plates. Iron plates by which the lower end of the bobstay is attached to the stem.

Bocca (Sp. *boca*, mouth). A term used both in the Levant and on the north coast of South America, or the Spanish Main, for a mouth or channel into any port or harbor, or the entrance into a sound which has a passage out by a contrary way. *Bocca Tigris*, Canton River.

Body. The principal corps of an army, or the main strength of a fleet. The figure of a ship, abstractly considered, is divided into different parts or figures, each of which has the appellation body, as fore-body, midship-body, square-body, etc.

Body-hoops. The hoops of a made mast.

Body-plan. A plan of a ship showing the breadth; it is a transverse section of the ship at the broadest part.

Body-post. The post at the forward end of the space in which the screw revolves.

Boggs, Charles Stewart, Rear-Admiral U.S.N. Born in New Brunswick, N. J., January 28, 1811. Appointed midshipman from same State, November 1, 1826. Attached to Mediterranean Squadron,—sloop of-war "Warren" and ship-of-the-line "Delaware,"—1827–30; West India Squadron, schooner "Porpoise," from 1830–32.

Promoted to passed midshipman, April 28, 1832; receiving-ship, New York, 1832; West Indies, sloop "Falmouth," 1833–34; rendezvous, New York, 1835–36.

Promoted to lieutenant, September 6, 1837; Pacific Squadron, ship-of-the-line "North Carolina" and schooner "Enterprise," 1837–38; receiving-ship "New York," in charge of apprentices, 1840–41; coast of Africa, sloop "Saratoga," 1842–43; participated in the destruction of the Bereby village on that coast; Home Squadron, 1846–47, steamer "Princeton"; present at siege of Vera Cruz; commanded boat expedition from the "Princeton," which destroyed the U. S. brig "Truxtun" after her surrender to the Mexicans; receiving-ship, New York, 1848; executive-officer of the frigate "St. Lawrence" to the World's Fair, London, 1848; first lieutenant navy-yard, New York, and inspecting for Bureau of Provisions and Clothing, 1851–54.

Commissioned as commander, September 15, 1855; commanding United States mail-steamer "Illinois," 1856–58; light-house inspector, California, 1860–61; commanding U. S. steamer "Varuna" at the passage of Forts Jackson and St. Philip, April 24, 1862. The "Varuna" was the only vessel of Farragut's squadron lost at the passage of the forts. From her great speed she was able to get ahead of all the fleet, and engage the rebel squadron above the forts. She was attacked by two rams, and sunk after being run into the bank of the river; causing, however, the destruction of the attacking vessels.

Commissioned as captain, July 16, 1862; commanded steam-sloop "Sacramento" on the blockade of Cape Fear River; left his command on account of serious sickness; special duty under Admiral Gregory, at New York, 1864–65; superintended the construction of small steam picket-boats, and specially designed and fitted out the torpedo-boat which, under the dashing Cushing, destroyed the rebel ironclad "Albemarle"; 1866, commanded the U. S. steamer "Connecticut," special cruise in the West Indies; fell in with the rebel ironclad "Stonewall" in the harbor of Havana, and previous to her being given up to the Spanish government, demanded her surrender to the United States.

Promoted to commodore, July 25, 1866; commanded steamer "De Soto," North Atlantic Squadron, 1866–68; special duty, to report on the condition of steam-engines afloat, 1869–70; commanding light-house depot, Tompkinsville, Staten Island, and light-house inspector, third district.

Commissioned as rear-admiral, July, 1870; commanding European Fleet, 1871–72; retired, 1873.

Bogue. To fall off from the wind; to edge away to leeward. The mouth of a river.

Boiler. A close vessel in which steam is generated, to be used as the motive force in steam-engines, and for other purposes. It is usually made of wrought-iron plates, overlapping at the edges and fastened with rivets. See MARINE BOILERS.

BOILER-ALARM. An apparatus to call attention to the low level of the water in the boiler.

BOILER-FEEDER. An apparatus, usually automatic and self-regulating, for keeping the boiler supplied with water.

BOILER-FLOAT. A float which rises and falls with the water in the boiler, and which shuts off the feed-water when the water has risen to the requisite height.

BOILER-IRON. Rolled plates of iron from one-fourth to one-eighth of an inch in thickness.

BOILER-PROTECTOR. A non-conducting material to prevent the escape of heat; as, felt, lagging, etc.

Boiling, the Whole. A contemptuous expression to denote the whole number or entire quantity.

Bold Bow. A broad bluff bow.

Boldering Weather. Cloudy and thundery.

Bold Shore. A coast where the water deepening rapidly permits the near approach of ships without danger of grounding.

Bold-to. A term applied to land when the adjacent water deepens rapidly. Steep-to.

Bole. A small boat.

Bolide. A name for an aerolite.

Boline. See BOWLINE.

Bollard. A timber around which a turn of the line is taken when a whale is struck, in order that the line may be veered steadily. A vertical timber projecting above the ground, to which hawsers are secured.

Bollard-timber. Usually called *knight-head* (which see).

Bolling, or Bowling Along. Going through the water rapidly with a free wind.

Bolme. An old term for a waterman's pole or boom.

Boloto. A small boat of the Philippines and Moluccas.

Bolsters. Small cushions or bags of tarred canvas, used to preserve the stays from being chafed by the motion of the masts when the ship pitches at sea. Pieces of soft wood covered with canvas, placed on the tressle-trees for the eyes of the rigging to rest upon and prevent a sharp nip. Also pieces of oak timber fayed to the curvature of the bow, under the hawse-holes, and down upon the upper cheek, to prevent the cable from rubbing against the cheeks.

Bolt. To start off; to run away. To swallow food without chewing it. A cylindrical bar of metal. Bolts take their names from the uses to which they are applied; as, *bringing-to bolt*, *drive-bolt*, etc.; from a peculiarity of construction; as, *eye-bolt*, *ring-bolt*, etc.; from the mode of securing them; as, *screw-bolt*, *bay-bolt*, etc. For a description of bolts see under the following heads: BARB-, BAY-, BRINGING-TO-, CLINCH-, COUNTERSUNK-HEADED-, DOUBLE-ENDED-, DRIVE-, DRIFT-, EYE-, FENDER-, FLUSH-, FORELOCK-, FOX-, JAGGED-, KEY-, LEWIS-, POINTED-, RAG-, RING-, RIVETED-, ROSE-HEADED-, ROUND-HEADED-, SCARF-, SCREW-, and SET-BOLT.

BOLT OF CANVAS. A roll of canvas containing 39 yards.

BOLT-AUGER. An auger for boring holes for bolts.

BOLT-CHISEL. A cold chisel for cutting off the projecting ends of bolts.

BOLT-CUTTER. A tool for cutting off bolts. A tool for cutting the thread on bolts.

Bolt-rope. A superior quality of hemp cordage used for roping sails.

BOLT-ROPE NEEDLE. A strong needle for stitching a sail to the bolt-rope.

Bolt-sprit. See BOWSPRIT.

BOLT-STRAKE. Strakes of plank through which pass the beam fastenings.

Bomb. A hollow ball or shell of cast iron charged with powder, and furnished with a fuse so adjusted that when the bomb reaches the end of its range the fuse ignites the powder in the shell and blows it to pieces. Bombs appear to have first come into use in the wars of the Netherlands, in the 17th century. See SHELL.

BOMB-BED. The platform which supports a mortar.

BOMB-KETCH. See MORTAR VESSEL.

BOMB-SHELL. See BOMB.

BOMB VESSEL. See MORTAR VESSEL.

Bombalo. A delicate kind of sand-eel taken in quantities at Bombay.

Bombard. An ancient piece of ordnance for throwing heavy projectiles. Its bore sometimes exceeded twenty inches in diameter. There were also smaller varieties of the bombard. See ORDNANCE.

A vessel in which beer was formerly carried to soldiers on duty; whence *bum-boat* (which see).

Bombay. A city and seaport on the island of Bombay, now artificially converted into a peninsula, all of which is included in the municipal limits. Lat. 18° 56′ N.; lon. 72° 53′ E. Since the development of cotton culture in India, Bombay has largely increased in wealth and importance. It is connected by railroads with most of the large cities of India, and by steamer lines, *via* Suez, with Great Britain. On the S.W. the fort is connected by Colabba causeway with the island of Colabba, on which are the light-house, observatory, and a stone pier. The harbor of Bombay is unequaled for safety in all India. It affords good anchorage for ships of the largest burden, and it has excellent building- and other docks for ships of the first class. Pop. 700,000.

Bombo. Weak, cold punch.

Bonaventure. The old outer mizzen, long disused.

Bone. To study. *To bone up* a subject, to study it thoroughly.

Bon-grace. Junk-fenders, to hang over the bows and sides of a vessel. See BOW-GRACE.

Bonito. The *Thynnus pelamys*, a fish of the scomber family, commonly about 2 feet long, with a sharp head, small mouth, full eyes, and a regular semilunar tail.

Boni-vochil. The Hebridean name for the great northern diver (*Colymbus glacialis*).

Bonnet. An additional part laced to the foot of the jibs, or other fore-and-aft sails, in small vessels in moderate weather, to gather more wind.

Bonnet-flook. The well-known flat-fish, brill, pearl, or mouse-dab; the *Pleuronectes rhombus*.

Bony-fish. A name for the hard-head (which see).

Bony Pike (*Lepidosteus*). A genus of ganoid fishes, conspicuous by being examples of a nearly extinct type.

Booby. A well-known tropical sea-bird, *Sula fusca*, of the family *Pelecanidæ*. It is fond of resting out of the water at night, even preferring an unstable perch on the yard of a ship. The name is derived from the way in which it allows itself to be caught immediately after settling. The direction in which it flies as evening comes on often shows where land may be found.

Booby-hatch. A smaller kind of companion, but readily removable. A kind of wooden hood over a hatch, fitted with a sliding top and readily removable.

Book. A commercial term for a peculiar packing of muslins, bastas, and other stuffs. *Brought to book*, made to account.

Books. Official documents. See SHIP'S BOOKS.

Boom. A long spar used to extend or boom out the foot of a particular sail. It takes its name from the sail it extends. (See JIB-, FLYING-JIB-, STUDDING-SAIL-, SPANKER-, RING-TAIL-, and MAIN-BOOM.) The name is also applied to a chain stretched across a river or mouth of a harbor to prevent the entrance of an enemy's vessel. See FIRE-SHIPS.

Booms may be employed in the defense of harbors either by themselves, or in combination with submarine mines. The essential qualities of a boom are that it shall possess great strength and be easy to manipulate. The main cable should be of wire or chain, and is buoyed up by spars, logs, etc. A space is left between each float to give the whole structure flexibility. The boom should be moored with heavy anchors up-stream, and with heavy chains without anchors down-stream; the former to counteract the force of the current, and the latter to oppose a yielding obstacle to the shock of ramming. The boom should be moored obliquely to the current, which compels an enemy's vessel to place herself athwart the current in order to ram the boom at right angles. The boom should be protected from the enemy's boats by small mechanical mines, and should be covered by batteries on each side of the bay or river. *To boom off*, to shove off a vessel or boat with spars. *To top up a boom* is to elevate one end of it by hauling on the topping lifts. A person is said *to top up his boom* when he fortifies himself with ardent spirits.

Booms. The space between the fore- and main-masts, in which the boom-boats and spare spars are stowed.

BOOM-BOATS. Boats carried inboard and stowed in the booms.

Boom-brace. A rope extending from the outer extremity of the topmast studding-sail-boom through a tail-block in the main-rigging.

Boom-cover. The large tarpaulin, or painted canvas cover, extending over the booms and boom-boats.

Boom-irons. Metal hoops or rings on the lower and topsail yards through which the booms traverse. See Pacific-irons.

Boom-jigger. A tackle used for rigging in and out the topmast studding-sail-booms.

Boomkin. See Bumkin.

Boom-mainsail. A fore-and-aft mainsail the foot of which is spread by a boom.

Boom-tricing-line. The line which trices up the heel of a stun'sail-boom.

Boopah. A Tongatabou canoe with a single outrigger.

Boötes (Gr. *boōtēs*, a plowman). The constellation following the Great Bear, which, it is probable, originally figured as an ox or wagon. Boötes is also called *Arctophylax*, the Bear-watcher; and the bright star *α Bootis* is named *Arcturus*, which means the Bear-keeper.

Boothyr. An old word for a small river vessel.

Boot-lick. One who cringes and flatters to obtain favors.

Boot-topping. The old operation of scraping off the grass, slime, shells, etc., which adhere to the bottom, near the surface of the water, and daubing it over with a mixture of tallow, sulphur, and resin, as a temporary protection against worms. This is chiefly performed where there is no dock or convenient situation for breaming or careening, or when the hurry of a voyage renders it inconvenient to have the whole bottom properly cleansed. The term is now applied to sheathing a vessel with planking over felt.

Booty. That sort of prize which may be distributed at the capstan-head, or at once.

Booze. A carouse; hence, *boozy*, elevated by liquor.

Bora. A very violent wind experienced in the upper part of the Adriatic Sea, but which fortunately is of no great duration.

Borasca. A storm, with thunder and lightning.

Bord. The sea-coast, an old term. Formerly meant the side, edge, or brim; hence, as applied to a ship, *to throw overboard* is to cast anything over the side of the vessel.

Borda, Jean Charles, a scientific French navigator, born at Dax, May 4, 1733; died in Paris, February 20, 1799. He was a teacher of mathematics; became a captain in the French navy, and by his scientific knowledge was of great service to the Count d'Estaing during the American war, in which he commanded the "Solitaire" with distinction. Made a member of the Academy of Sciences in 1756. In 1771 he made a voyage to America for scientific purposes, and again in 1774, and at a later period, of which he published an account in 1778. He founded the School of Naval Architecture in France, invented nautical instruments, was one of the scientific men who framed the French metric system, and published some treatises on hydraulics. Member of the French Institute.

Bordeaux. A city in the S.W. of France, on the Garonne, 60 miles from its mouth, and chiefly on its left bank. Lat. 44° 50′ 19″ N.; lon. 0° 34′ 32″ W. Situated on a navigable river, in this part 2600 feet wide and from 60 to 90 feet deep, Bordeaux takes rank next after Marseilles and Havre among the ports of France both in foreign and coastwise trade. Its harbor or basin, formed by the Garonne, is capable of containing 1200 ships of the largest size, and is accessible for vessels of 600 tons at all times of the tide. It has docks and building-yards for every size of vessels. Its principal exports are wines, brandy, and fruits. Pop. 225,000.

Bordels. An old word for houses built along a strand.

Bord You. A saying of a man waiting, to one who is drinking, meaning that he claims the next turn.

Bore. The cavity, generally cylindrical in shape, of a piece of ordnance; also, the diameter of this cavity. A sudden and rapid flow of tide in certain inlets of the sea; as, the monstrous wave in the river Hoogly, called *bahu* by the natives, which rolls in with the noise of distant thunder at flood-tide. It occurs from February to November, at the new and full moon. Its cause has not been clearly defined, although it probably arises from the currents during spring-tides, acting on a peculiar conformation of the banks and bed of the river; it strikes invariably on the same part of the banks, majestically rolling over to one side, and passing on diagonally to the other with impetuous violence. The bore also occurs in England, near Bristol; and in America, in several rivers, but especially in the Bay of Fundy, where, at the river Petticodiac, the tide rises 76 feet. It also occurs in Borneo and several rivers in the East.

Attention to the bore in different places is of great importance to the seaman. No boat ventures to navigate the channels between the islands at the mouth of the Brahmapootra at spring-tide; in the Hoogly, the bore running along one bank only, on its approach the smaller shipping is removed to the other side, or ride it out in mid-stream; and in some of the rivers of Brazil the barges, at the spring-tides, are always moored in deep water, it being noticed that the bore is only dangerous on the shoals.

Boreas. Son of Æstræus and Heribeia, generally put for the north wind.

Bore Down. Sailed down from to windward.

Boring. In Arctic seas, the operation of forcing a ship through the loose ice.

Boring-bit. A tool for clearing the vent of a gun.

Borrachio (Sp. *borracho*, drunk). A skin, usually a goat's, for holding wine or water. Used in the Levant. A skin-full; literally, gorged with wine.

Borrow. To approach closely either to land or wind; to hug a shore or coast to avoid an adverse tide.

Bort. The name given to a fishing-line in the Shetland Isles.

Boscawen, Edward, Admiral. Born August 19, 1711. Measuring men by their success, this very distinguished sailor occupies a high place in British annals. For twenty years he was in continual active service. The West Indies, the South American coast, the Mediterranean, India, and the coast of North America were

the scenes of his professional employment. Frequently engaged in contests with the French, he, singularly enough, three times took prisoner the same admiral, and carried more prizes into English ports than any other seaman before or since. Vice-admiral of the blue, 1756. Died January 10, 1761.

Boss. An elevated or thickened portion, usually around an aperture; as, a socket for a pivot-bolt. A master-workman or superintendent.

Boston (Mass.) is on a bay called Boston Harbor, which forms the inner bight of Massachusetts Bay, at the mouth of the Charles and Mystic Rivers. Lat. 42° 21′ 27.6″ N.; lon. 71° 3′ 30″ W. The harbor is excellent, and the wharves, warehouses, and other shipping facilities are not surpassed. Steamers ply hence to Europe and to the principal ports of the United States. Boston has a large trade with the West Indies, and with Nova Scotia and New Brunswick, and the coastwise traffic is extensive. Her commerce with India, China, and Liverpool is very large, although less than it was twenty years ago. Much capital has been expended in the extension of harbor facilities. The inner harbor is completely sheltered, not difficult of access, and is seldom encumbered by ice. Several large works have been constructed for its defense, Forts Warren, Independence, and Winthrop being the most important. The channel is well lighted, the structure on Minot's Ledge being the outermost and highest of its four light-houses. The harbor covers 75 square miles, and has a minimum depth of 23 feet above mean low tide. Charlestown, formerly a suburb of Boston, now incorporated with it, is the seat of a large United States navy-yard. Pop. about 352,000.

Botany Bay. Discovered by Cook in 1770, and received its name from the great variety of herbs found on its shores. The settlement was selected as a site for a colony of English convicts, and the first governor arrived in January, 1788. The colony was eventually located at Port Jackson, 13 miles north of the bay.

Botarga. The roe of the mullet pressed flat and dried; that of commerce, however, is from the tunny, a large fish of passage which is common in the Mediterranean.

Botch. To make bungling work.

Bote's-carle. An old word for coxswain.

Both Sheets Aft. A ship before the wind has both fore-sheets hauled aft. The expression is also applied to a half-drunken sailor rolling along with both hands in his pockets and elbows square.

Botte. An old word for boat.

Bottle-charts. Charts on which the set of surface currents is marked, when the set has been calculated from the data found in bottles thrown overboard and washed up on the beach, or picked up by ships.

Bottle-nose, or Bottle-nosed Whale. A name applied to several of the smaller cetaceans of the northern seas, more especially to the *Hyperoodon rostratus*.

Bottom. The lowest part of anything. The rich low land formed by alluvial deposits. The part of a ship under water; hence, the ship itself; as "foreign bottoms." A *full bottom* denotes that such a form has been given to a ship as to allow her to carry a large amount of merchandise. The bed of a body of water; it is characterized as muddy, rocky, sandy, etc.

BOTTOM-CLEAN. Thoroughly clean, free from weeds, etc.

Bottomry. A contract in the nature of a mortgage of a ship when the owner, or his agent, borrows money to enable him to carry on his voyage, and pledges the keel or *bottom* of the ship (*partem pro toto*) as a security for the repayment. If the ship be lost the lender loses also his whole money; but if it return in safety then he shall receive back his principal, and also the premium stipulated to be paid, however it may exceed the usual or legal rate of interest. And this is allowed to be a valid contract in all trading nations, for the benefit of commerce, and by reason of the extraordinary hazard run by the lender. And in this case the ship and tackle, if brought home, are answerable (as well as the borrower personally) for the money lent. But if the loan be not upon the vessel, but upon the goods and merchandise, which must necessarily be sold or exchanged in the course of the voyage, then only the borrower, personally, is bound to answer the contract, and in this case he is said to take the money at *respondentia* (which see).

BOTTOMRY PREMIUM. The high rate of interest charged on the safety of the ship,—the lender losing his whole money if she be lost.

Bottom-wind. A phenomenon that occurs on the lakes in the north of England, especially Derwent Water, which is often agitated by swelling waves without any apparent cause.

Bouche. See BUSH.

Bougainville, Louis Antoine de. Born in Paris, November 11, 1729. The first voyage round the world by a Frenchman was made by this illustrious seaman. He crossed the Atlantic, braved the stormy seas around Cape Horn, and passed into the Pacific. He visited many places on the western shores of America and among the islands in the Pacific, but the charts which he prepared and bequeathed to his country and posterity are not reliable, owing to the great difficulty in Bougainville's day of making astronomical observations, and the imperfect character of the plans laid down by men of science for ascertaining the longitude. Died August 31, 1811.

Bouge. See BOWGE.

Bouge and Chine, or Bowge and Chime. A method of stowing casks with the bilge of one against the end of another.

Bouguer, Pierre. Born at Le Croisic, in Bretagne, February 16, 1698. A profound French mathematician, who was one of a body of *savants* deputed in 1735 to proceed to South America to measure a degree of the meridian at the equator. Died August 15, 1758.

Bouilli. Preserved beef in hermetically-sealed cans; termed by sailors "bully-beef," or "soup and bully."

Boulder. See BOWLDER.

Boulogne. A town of France, on the English Channel, at the mouth of the Lianne. Lat. 50° 44′ 32″ N.; lon. 1° 36′ 15″ E. The port is formed by piers stretching out only to low-water mark, but the tide rises upwards of 16 feet, and vessels find good anchorage about half a mile from the harbor. There is also a wet-dock with other harbor improvements. Pop. 40,000.

Bounce. The larger dog-fish.

Bouncer. A gun which kicks violently when fired.

Bound. The path of a projectile between two grazes. Destined; going, or intending to go. *Where are you bound?* to what place are you going. *Ice-bound*, entirely surrounded by ice. *Tide-bound*, beneaped, or prevented from sailing by an adverse tide. *Wind-bound*, prevented from sailing by an unfavorable wind.

Boundary-line. The trace of the outer surface of the skin of a ship on the stern-post, stem, and keel.

Bounty for Destruction of Enemies' Vessels. An amount awarded to a ship or vessel of the United States which sinks or destroys a vessel of war belonging to an enemy. If the vessel destroyed was of equal or superior force to the United States vessel, the latter is awarded $200 for each person on board the former at the beginning of the engagement; if of inferior force, $100 for each person. If the captors of an enemy's vessel are instructed to, or do immediately, destroy the vessel for the public interest, $50 is awarded for each person on board the vessel at the time it was captured. The gross amount awarded as above is divided among the officers and crew in the same manner as prize-money. (See PRIZE-MONEY.) When the actual number of persons on board the destroyed vessel cannot be ascertained, it is estimated according to the complement of a vessel of its class in the United States navy. This bounty is authorized by the laws of the United States, but cannot be paid unless an appropriation is made by Congress for that purpose.

Bourdonnais, Bertrand F. de. A naval officer in the service of the French East India Company. He held the post of Director-General of Mauritius (then called the Isle of France) and Bourbon; and in 1746, when France and England were at war, he beat a squadron under Admiral Bassett, and bombarded the city of Madras.

Bourse (*Fr.*). An exchange; a place where merchants congregate to transact business.

Bouse. See BOWSE.

Bout. A turn, round, or trial. A convivial meeting.

'Bout-ship. A contraction of *about-ship*. An order to prepare for going about.

Bow. The forward part of a vessel. A *full* or *bluff* bow is broad and round; a *sharp* or *lean* bow is narrow and thin. The bow *flares* more or less as it falls out or increases in breadth at the upper part. *Doubling of the bows*, a thick planking secured on the bow to prevent the point of the anchor from injuring it. *Bows on*, stem first. *On the bow*, at an angle less than 45° from the ship's course. *Broad off the bow*, at an angle of 45° from the ship's course.

Bow. An old instrument for taking angles, consisting of a graduated arc of 90°, three vanes, and a staff.

Bow-bye. An old expression for the situation of a ship when she is in irons.

Bow-chaser. A gun placed in the bow to fire on a retreating vessel.

Bowd-eaten. An old term for eaten by weevils.

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the scenes of his professional employment. Frequently engaged in contests with the French, he, singularly enough, three times took prisoner the same admiral, and carried more prizes into English ports than any other seaman before or since. Vice-admiral of the blue, 1756. Died January 10, 1761.

Boss. An elevated or thickened portion, usually around an aperture; as, a socket for a pivot-bolt. A master-workman or superintendent.

Boston (Mass.) is on a bay called Boston Harbor, which forms the inner bight of Massachusetts Bay, at the mouth of the Charles and Mystic Rivers. Lat. 42° 21′ 27.6″ N.; lon. 71° 3′ 30″ W. The harbor is excellent, and the wharves, warehouses, and other shipping facilities are not surpassed. Steamers ply hence to Europe and to the principal ports of the United States. Boston has a large trade with the West Indies, and with Nova Scotia and New Brunswick, and the coastwise traffic is extensive. Her commerce with India, China, and Liverpool is very large, although less than it was twenty years ago. Much capital has been expended in the extension of harbor facilities. The inner harbor is completely sheltered, not difficult of access, and is seldom encumbered by ice. Several large works have been constructed for its defense, Forts Warren, Independence, and Winthrop being the most important. The channel is well lighted, the structure on Minot's Ledge being the outermost and highest of its four light-houses. The harbor covers 75 square miles, and has a minimum depth of 23 feet above mean low tide. Charlestown, formerly a suburb of Boston, now incorporated with it, is the seat of a large United States navy-yard. Pop. about 352,000.

Botany Bay. Discovered by Cook in 1770, and received its name from the great variety of herbs found on its shores. The settlement was selected as a site for a colony of English convicts, and the first governor arrived in January, 1788. The colony was eventually located at Port Jackson, 13 miles north of the bay.

Botarga. The roe of the mullet pressed flat and dried; that of commerce, however, is from the tunny, a large fish of passage which is common in the Mediterranean.

Botch. To make bungling work.

Bote's-carle. An old word for coxswain.

Both Sheets Aft. A ship before the wind has both fore-sheets hauled aft. The expression is also applied to a half-drunken sailor rolling along with both hands in his pockets and elbows square.

Botte. An old word for boat.

Bottle-charts. Charts on which the set of surface currents is marked, when the set has been calculated from the data found in bottles thrown overboard and washed up on the beach, or picked up by ships.

Bottle-nose, or Bottle-nosed Whale. A name applied to several of the smaller cetaceans of the northern seas, more especially to the *Hyperoodon rostratus.*

Bottom. The lowest part of anything. The rich low land formed by alluvial deposits. The part of a ship under water; hence, the ship itself; as "foreign bottoms." A *full bottom* denotes that such a form has been given to a ship as to allow her to carry a large amount of merchandise. The bed of a body of water; it is characterized as muddy, rocky, sandy, etc.

BOTTOM-CLEAN. Thoroughly clean, free from weeds, etc.

Bottomry. A contract in the nature of a mortgage of a ship when the owner, or his agent, borrows money to enable him to carry on his voyage, and pledges the keel or *bottom* of the ship (*partem pro toto*) as a security for the repayment. If the ship be lost the lender loses also his whole money; but if it return in safety then he shall receive back his principal, and also the premium stipulated to be paid, however it may exceed the usual or legal rate of interest. And this is allowed to be a valid contract in all trading nations, for the benefit of commerce, and by reason of the extraordinary hazard run by the lender. And in this case the ship and tackle, if brought home, are answerable (as well as the borrower personally) for the money lent. But if the loan be not upon the vessel, but upon the goods and merchandise, which must necessarily be sold or exchanged in the course of the voyage, then only the borrower, personally, is bound to answer the contract, and in this case he is said to take the money at *respondentia* (which see).

BOTTOMRY PREMIUM. The high rate of interest charged on the safety of the ship,—the lender losing his whole money if she be lost.

Bottom-wind. A phenomenon that occurs on the lakes in the north of England, especially Derwent Water, which is often agitated by swelling waves without any apparent cause.

Bouche. See BUSH.

Bougainville, Louis Antoine de. Born in Paris, November 11, 1729. The first voyage round the world by a Frenchman was made by this illustrious seaman. He crossed the Atlantic, braved the stormy seas around Cape Horn, and passed into the Pacific. He visited many places on the western shores of America and among the islands in the Pacific, but the charts which he prepared and bequeathed to his country and posterity are not reliable, owing to the great difficulty in Bougainville's day of making astronomical observations, and the imperfect character of the plans laid down by men of science for ascertaining the longitude. Died August 31, 1811.

Bouge. See BOWGE.

Bouge and Chine, or Bowge and Chime. A method of stowing casks with the bilge of one against the end of another.

Bouguer, Pierre. Born at Le Croisic, in Bretagne, February 16, 1698. A profound French mathematician, who was one of a body of *savants* deputed in 1735 to proceed to South America to measure a degree of the meridian at the equator. Died August 15, 1758.

Bouilli. Preserved beef in hermetically-sealed cans; termed by sailors "bully-beef," or "soup and bully."

Boulder. See BOWLDER.

Boulogne. A town of France, on the English Channel, at the mouth of the Lianne. Lat. 50° 44′ 32″ N.; lon. 1° 36′ 15″ E. The port is formed by piers stretching out only to low-water mark, but the tide rises upwards of 16 feet, and vessels find good anchorage about half a mile from the harbor. There is also a wet-dock with other harbor improvements. Pop. 40,000.

Bounce. The larger dog-fish.

Bouncer. A gun which kicks violently when fired.

Bound. The path of a projectile between two grazes. Destined; going, or intending to go. *Where are you bound?* to what place are you going. *Ice-bound*, entirely surrounded by ice. *Tide-bound*, beneaped, or prevented from sailing by an adverse tide. *Wind-bound*, prevented from sailing by an unfavorable wind.

Boundary-line. The trace of the outer surface of the skin of a ship on the stern-post, stem, and keel.

Bounty for Destruction of Enemies' Vessels. An amount awarded to a ship or vessel of the United States which sinks or destroys a vessel of war belonging to an enemy. If the vessel destroyed was of equal or superior force to the United States vessel, the latter is awarded $200 for each person on board the former at the beginning of the engagement; if of inferior force, $100 for each person. If the captors of an enemy's vessel are instructed to, or do immediately, destroy the vessel for the public interest, $50 is awarded for each person on board the vessel at the time it was captured. The gross amount awarded as above is divided among the officers and crew in the same manner as prize-money. (See PRIZE-MONEY.) When the actual number of persons on board the destroyed vessel cannot be ascertained, it is estimated according to the complement of a vessel of its class in the United States navy. This bounty is authorized by the laws of the United States, but cannot be paid unless an appropriation is made by Congress for that purpose.

Bourdonnais, Bertrand F. de. A naval officer in the service of the French East India Company. He held the post of Director-General of Mauritius (then called the Isle of France) and Bourbon; and in 1746, when France and England were at war, he beat a squadron under Admiral Bassett, and bombarded the city of Madras.

Bourse (*Fr.*). An exchange; a place where merchants congregate to transact business.

Bouse. See BOWSE.

Bout. A turn, round, or trial. A convivial meeting.

'Bout-ship. A contraction of *about-ship*. An order to prepare for going about.

Bow. The forward part of a vessel. A *full* or *bluff* bow is broad and round; a *sharp* or *lean* bow is narrow and thin. The bow *flares* more or less as it falls out or increases in breadth at the upper part. *Doubling of the bows*, a thick planking secured on the bow to prevent the point of the anchor from injuring it. *Bows on*, stem first. *On the bow*, at an angle less than 45° from the ship's course. *Broad off the bow*, at an angle of 45° from the ship's course.

Bow. An old instrument for taking angles, consisting of a graduated arc of 90°, three vanes, and a staff.

Bow-bye. An old expression for the situation of a ship when she is in irons.

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Bowline-knot. A knot much in use on board ship. The loop can be made of any size, and does not jamb nor render.

Bow-lines. Longitudinal curves representing the ship's fore-body.

Bowling Along. Sailing rapidly with a free wind.

Bowman, or Bow-oarsman. The man who pulls the forward oar in a single-banked boat. In a double-banked boat there are two bowmen.

Bow-oar. The foremost oar or oars in a pulling boat.

Bow-rail. The rail around the bows.

Bowse. To haul heavily upon a rope or tackle. *Bowse up the jib*, a colloquialism to denote the act of tippling. It is an old term, probably derived from the Dutch *buyzen*, to booze.

Bowsprit. A large spar projecting over the bows to support the foremast and extend the head-sails. It is supported laterally by shrouds, and from below by the gammoning and bobstays. The outer end is the *head*, the inner end the *heel*, and that portion which is inboard is called the *housing*. A *running-in* bowsprit is used in boats, and when the jib is hauled down, the bowsprit is run in.

Bowsprit-bitts. Strong upright timbers secured to the beams below the deck; they have a cross-piece bolted to them, the inner end of the bowsprit steps between them, and is thus prevented from slipping in. The cross-piece prevents it from canting up.

Bowsprit-cap. The cap on the outer end of the bowsprit, through which the jib-boom traverses.

Bowsprit-chock. A piece placed between the knight-heads, fitting close upon the upper part of the bowsprit.

Bowsprit-gear. A term denoting the ropes, blocks, etc., belonging to the bowsprit.

Bowsprit-heart. The heart or block of wood used to secure the lower end of the fore-stay, through which the inner end of the jib-boom is inserted. It is seldom, if ever, used now.

Bowsprit-horses. The ridge-ropes which extend from the bowsprit-cap to the knight-heads.

Bowsprit-netting. The netting placed just above a vessel's bowsprit, for stowing the fore-topmast staysail; it is usually lashed between the ridge-ropes.

Bowsprit-shrouds. Strong ropes or chains leading from nearly the outer end of the bowsprit to the bow, giving lateral support to that spar.

Bow-timbers. The timbers which form the bow of a ship.

Box. See Cartridge-, Coxswain-, Passing-, Primer-, Transporting-, and Shell-box.

Boxhauling. An evolution by which a ship is veered short round on her heel, when the object is to avoid making a great sweep. Luff; when headway has ceased, haul up mainsail, brail up spanker, square after-yards, brace abox head-yards. Keep the after-sails lifting till braced up sharp on the other tack, and lay the head-yards square. Shift the helm when the ship gathers headway, and set the mainsail and spanker when they will take on the other tack. With much wind and sea this evolution would be dangerous, and it is seldom performed except in a case of emergency, as a seaman never likes to see his ship have sternway.

Boxing. Any projecting wood forming a rabbet; as, the boxing of the knight-heads.

Box-metal. A composition of 32 parts of copper to 5 of tin.

Box-off. To force the ship's head off from the wind by hauling aft the head-sheets and bracing aback the head-yards.

Box the Compass. To repeat the names of the points of the compass in regular order.

Boy. A rating in the navy. See Naval Apprentice System.

Boyart. An old term for a hoy.

Boyer. A sloop of Flemish construction, with a raised work at each end.

Brab. The sheaf of the young leaves of the Palmyra palm, from which sennit for hats is made.

Brab-tree. The Palmyra palm.

Brace. A composition strap to receive a pintle of the rudder; a gudgeon. A prop or support. In carpentry and engineering the term strictly applies to something that supports parts in compression, being the opposite of a *stay* or *tie;* but in boiler-making it is sometimes applied to parts in tension.

One of the ropes attached to the extremities of the yards by which they are moved about horizontally. They also assist in counteracting the lateral strain brought on the yard by the wind acting on the sail. *To brace* a yard, to move it horizontally by the braces. *To brace up*, to haul in the lee braces. To brace up *sharp*, to brace a yard as far forward as the stay and rigging will permit it to go. *To brace in*, to haul in the weather braces. *To brace to*, to check the lee head-braces and haul in the weather ones to allow the ship's head to come up to the wind rapidly. *To brace aback*, to so brace a yard that its sail will be aback. *To brace abox*, to lay the head-yards abox. *To counter-brace* the yards is to brace them all sharp up, the head-yards by opposite braces to the after-yards.

Brace of Shakes. An expression signifying "in a moment"; as, I will be with you in a *brace of shakes*. The expression is taken from the flapping of a sail.

Brace Pendant. A length of rope or chain into which the yard-arm brace-blocks are spliced. They are in use in the merchant service, and have the following advantages, viz., rope is saved, the blocks have more play, and when the lee brace is let go the weight of the chain overhauls the brace.

Brace Up! Gather Aft! An order to brace up the head-yards and haul aft the head-sheets which had been flowing.

Bracket. A short crooked timber resembling a knee, used as a support. One of the vertical side pieces of a gun-carriage; when made of wood they are generally formed of two pieces jogged and doweled together.

Brackish. Moderately salty; applied to river water mingled with sea water.

Brad. A small nail without a head, having a projection at the top on one side.

Brad-awl. A tool to pierce holes for the insertion of brads.

Brail. Brails are ropes, the bights of which are seized to the leech of a trysail, leading through blocks on the gaff or luff. All trysails are fitted with them. They serve to gather up the sail ready for the furling-line. When a jib is fitted with brails it is for the purpose of lifting the clew clear of the stays when the sheet is

shifted over. *Foot-brails*, the lowest brails. *Peak-brails*, the outermost brails on the gaff. *Throat-brails*, the brails which make fast to the clew of the sail and reeve through a block at the jaws of the gaff. *Brail-up!* the order to pull on the brails and thereby spill the sail and haul it up for furling.

Brake. The lever which works a pump. A piece of mechanism for retarding or stopping machinery by friction.

Bran. To go on. To lie under a floe edge, in foggy weather, in a boat in Arctic seas, to watch the approach of whales.

Branch (*Eng.*). The diploma of those pilots who have passed at the Trinity House, as competent to navigate vessels in particular places.

Branch-pilot (*Eng.*). One approved by the Trinity House, and holding a branch, for a particular navigation.

Brand. The Anglo-Saxon for a burnished sword. A burned device or character.

Branded Ticket (*Eng.*). A discharge given to an infamous man, on which his character is written, and the reason he is turned out of the service. In the army, deserters are branded with D; also B for bad character. In the navy, a corner of the ticket is cut off.

Brandling. A supposed fry of the salmon species, found on the north of England coasts. Also, the angler's dew-worm.

Bran-new. Brand-new; quite new.

Brash. Small fragments of crushed ice, collected by the wind or sea near the shore, which a ship can force her way through.

Brass. Impudent assurance. An alloy of copper and zinc. The proportions vary according to the required color and proposed use. The term is often employed as synonymous with bronze (which see), as when it is applied to ordnance, the bearings of machinery, etc. See BRIGHT-WORK, SHEATHING.

Brave. This word is used to express strength as well as courage; as, a brave wind.

Brawet. A kind of eel.

Brazil, Navy of. Fifty-seven steamers, of which 18 are ironclads, carrying 68 guns, and possessing 5060 horse-power, represent the navy of the Brazilian empire. The gunboats are 23 in number. The rest of the vessels are corvettes and transports, and 1 small frigate. The crews consist altogether of 4200 sailors, and for their command and the general management of naval affairs there is a minister of marine, 1 admiral, 2 vice-admirals, 4 rear-admirals, 8 chiefs of division, 16 post-captains, 30 captains of frigates, 60 commanders, 146 lieutenants, and 88 sub-lieutenants. There are 5 naval arsenals and [illegible] good naval school.

Breach. An old term for a [illegible]vy surf. An old word to denote the gap i[illegible] levee or bank made by the breaking in of [illegible] sea, now also applied to the opening or gap [illegible]ortified works, made by an enemy's guns. [illegible]olling of waves over a vessel; a *clear* brea[illegible]plies that the waves roll over without [illegible]ng, and a sea makes a *clean* breach when [illegible]asts and every object on deck are swept a[illegible]

Breaching. A word m[illegible] the act of leaping out of the water; app[illegible] whales.

Breachy. Brackish, a[illegible]ed to water, probably derived from the fa[illegible]t water was made brackish by the sea break[illegible]

Bread. The usual name given to biscuit for ship's use.

Bread-fruit. The fruit of a tree (*Artocarpus incisa*) found in the islands of the Pacific. When baked it somewhat resembles bread. The name is also applied to the tree.

Bread-room. A water-tight compartment in which the bread is stowed.

Bread-room Jack. See JACK O' THE DUST.

Bread-tree. See BREAD-FRUIT.

Break. An opening in the clouds. An interruption; as, a break in an electric circuit. A sudden ending; as, the break of the poop. To deprive of commission, warrant, or rating. To shatter into pieces; as, a wave breaks. *To break one's liberty or leave* is to remain away beyond the time specified for returning. *To break off*, to be forced off to leeward of the course by a change in the direction of the wind. *Break off!* An order to stop working at one job to begin at another. *To break up*, to separate into parts; as, the ice breaks up. *To break up a ship* is to take her to pieces when she becomes old and unserviceable. *Breaking up* of the monsoon, the ending or shifting of a monsoon. This period is generally prolific of violent storms. *Breaking of a gale*, indications of a return of fair weather. *To break bulk*, to destroy the entirety of a cargo by removing a portion of it. *To break ground*, to heave the anchor clear of the ground. *To break joints*, to so arrange the planking that the joints in adjoining courses do not coincide with each other. When a ship at anchor is forced by the wind or current out of her proper position she is said to *break her sheer*.

Breakage. Damage to goods in being broken. The leaving of empty spaces in stowing the hold.

Break-beam. A beam at the break of a deck.

Breaker. A small water-cask. A wave which breaks violently over reefs or rocks lying at, or under, the surface of the water. They are distinguished both by their appearance and by their sound, as they cover the sea with foam and produce a loud roaring. *Breakers ahead!* A warning from the lookout that there is broken water in the direction the ship is standing.

Breakwater. Any structure or contrivance, as a mole, mound, wall, or sunken hulk, to break the force of waves and protect a harbor or anything which is exposed to the force of the waves.

Bream. A common fresh- as well as salt-water fish (*Abramis brama*), little esteemed as food.

Breaming. Cleaning a ship's bottom by burning off the grass, ooze, shells, or sea-weed, which it has contracted by lying long in harbor; it is performed by holding kindled furze, fagots, or reeds to the bottom, which, by melting the pitch that formerly covered it, loosens whatever filth may have adhered to the planks; the bottom is then covered anew with a composition of sulphur, tallow, etc., which not only makes it smooth and slippery, so as to divide the fluid more readily, but also poisons and destroys those worms which eat through the planks in the course of a voyage. This operation may be performed either by laying the ship aground after the tide has ebbed from her, or by docking or careening.

Breast. To run abeam of a cape or object. To cut through a sea, the surface of which is poetically termed breast. *To breast the sea*, to meet it by the bow on a wind. *To breast the*

surf, to brave it, and overcome it by swimming. *To breast a bar*, to heave at the capstan. *To breast to*, the act of giving a sheer to a boat.

Breast-backstay. Breast-backstays extend from the head of an upper mast, through an outrigger, down to the channels forward of the standing backstays, for supporting the upper spars from to windward. When to leeward, they are borne abaft the top-rim.

Breast-fast. A rope or chain used to confine the midship part of a ship to a wharf or another ship, as the bow-fast confines her forward, and the stern-fast abaft. See FAST.

Breast-gaskets. An old term for bunt-gaskets.

Breast-hooks. Large pieces of compass-timbers or knees fitted in the bows of ships against the apron and stemson, with the arms running back across the timbers of the bow. Those in the line of the decks are called deck-hooks.

Breast-rail. The upper rail of the balcony; formerly it was applied to a railing in front of the quarter-deck, and at the after-part of the forecastle-deck.

Breast-rope, or Breast-band. A rope or band fitted between the shrouds in the chains for the safety of the leadsman.

Breather. A tropical squall.

Breath of Wind. The lightest perceptible air.

Breech. The outer angle of a knee-timber. The end of a block farthest from the hook. The portion of a gun abaft the chamber.

BREECH-BLOCK. A mass of metal which closes the breech of a gun, and receives the rear thrust of the charge when it is fired.

BREECHING. A large rope rove through the cascabel of a gun and secured to the ship's side, to limit the recoil. Breechings are made of hemp, and they are not to be covered, blackened, nor rendered less pliable in any way.

BREECHING-BOLT. A bolt in the ship's side to which the breeching is shackled.

BREECH-LOADER. A gun, large or small, which is charged at the breech. The objects sought to be attained by this change from the old system are rapidity in loading, facility of cleaning, accurate adjustment of the size of the shot to the calibre of the gun, and facility in making the shot accommodate itself to the rifling. Additional mechanism is required, as the breech must be so far opened as to admit the shot and cartridge, and then so firmly closed as to resist the immense pressure occasioned by the discharge of the piece. See ORDNANCE and SMALL-ARMS.

BREECH-PIN. A plug screwed into the rear-end of a gun-barrel, forming the bottom of the bore. Called also a breech-screw or breech-plug.

BREECH-PLUG. See BREECH-PIN.

BREECH-SCREW. See BREECH-PIN.

BREECH-SIGHT. See SIGHT.

Breese, Samuel L., Rear-Admiral U.S.N. Born in New York. Appointed at large, September 10, 1810. Midshipman Breese was present at the battle of Lake Champlain. Commissioned as lieutenant, April 27, 1816, and as commander, December 22, 1835. Commissioned as captain, September 8, 1841.

Captain Breese was in the Pacific during the Mexican war, and was present at the attack on, and capture of, the towns Tuspan and Tobasco, Mexico, and at the capture of Vera Cruz, 1847; special duty on the lakes, 1848; commandant Norfolk navy-yard, 1853–55; commanding Mediterranean Squadron, 1856–58; commandant navy-yard, New York, 1859–61.

Commissioned as rear-admiral, July 16, 1862; light-house inspector, 1862; special duty, New York, 1865; port admiral at Philadelphia, 1867–68. Died in Philadelphia, 1870.

Breeze. A wind which may be characterized as light, gentle, moderate, fresh, stiff, or strong. The *land* and *sea* breezes are occasioned by the unequal heating of the land and water. On the coast within the tropics, a light breeze sets in from the sea in the morning, and gradually increases in strength until the hottest portion of the day, when it begins to decrease, and sinks to a calm toward sunset. Soon after the land-breeze commences to blow, and continues until the morning, when it gives place, in turn, to the sea-breeze.

During the day the land becomes more heated than the sea, and the air over the land ascends, and the cold air from the sea rushes in to supply its place. After sunset the land parts with its heat more readily than the water, and the temperature falls below that of the sea, and the air becoming heavier and denser, flows out to sea as a land-breeze.

TO KICK UP A BREEZE. To create a disturbance. When the wind increases it is said to *breeze up*.

Brest. A city of France, on the N. shore of a small gulf, called the Road of Brest. Lat. (of observatory) 48° 23′ 32″ N.; lon. 4° 29′ 25″ W. It is a fortified city of the first class. From its natural advantages, the extent of its various establishments, and its means of defense, Brest is one of the first naval ports in Europe. The outer road is one of the finest in the world, and has no superior in the safety and excellence of its anchorage. It communicates with the sea by a single passage, called the Goulet, 1750 yards broad. In the middle of the passage rise the Mingan Rocks, which contract the entrance, and oblige vessels to pass directly under the batteries. It has extensive quays, large basins, vast magazines, ship-yards, etc. Brest has important educational establishments, and the naval school is here located. The port has little trade, and its manufacturing establishments outside the arsenals are not large. A telegraph cable extends to Duxbury, Mass. Pop. 70,000.

Brewing. Gathering or forming; as, a storm which is foretold by the gathering of clouds, or other indications.

Bricklayer's Clerk. A contemptuous expression for one who pretends to have seen "better days," but who is forced to betake himself to seafaring.

Bridge. A [illegible] arrangement of electrical circuits used for [illegible] the resistance of a substance in the cir[illegible]

A plati[illegible] or other substance, in a circuit, whi[illegible] A [illegible]eat resistance to the passage of the cu[illegible] [illegible]eason of this resistance heat is evolve[illegible] the current be sufficient, ignites th[illegible]

Bridge. [illegible] ridge of rock, sand, or shingle, a[illegible]tom of a channel, so as to occasion a[illegible] which the tide ripples.

Bridge. [illegible] partition in a furnace. It may be [illegible] brick or of iron. Some-

times it is hollow, and forms a portion of the water-space of a boiler.

Bridge. A platform extending across the deck above the rail for the convenience of the officer in charge of the ship. Some vessels have two bridges, one forward of the main- and the other forward of the mizzen-mast. In paddle-wheel vessels it connects the paddle-boxes.

Bridgeport, a city and port of entry of Connecticut, is on a small inlet of Long Island Sound, at the mouth of the Pequonnock River. Steamers ply daily between this port and New York. Pop. 20,000.

Bridle. A chain or rope span, both ends of which are made fast, the power being applied to the bight or middle portion.

BOWLINE-BRIDLE. A span the legs of which are attached to the leech of a sail, and the bowline is bent to the bight.

BRIDLE-CABLE. The cable which is bent to a bridle.

MOORING-BRIDLE. The chains of permanent moorings.

Bridle-port. The forward port on the gun-deck.

Brig. The name given to the place where prisoners are confined on board men-of-war. A two-masted square-rigged vessel. See BRIG-SCHOONER and HERMAPHRODITE BRIG.

Brigantine. A two-masted square-rigged vessel, differing from a brig in that she does not carry a square mainsail.

Bright Look-out. A vigilant look-out.

Bright-work. A term applied to metal objects which are kept bright by polishing; as, the railing about the hatches, capstan-head, cap-squares, lock- and sight-covers, metal blocks, rear face of the cascabel, face of the muzzle, ring-bolts in the decks, etc. *Bright wood-work* is a term applied to the wood-work which is scraped and scrubbed; as, the pin-rails, cavils, cleats, halliard-racks, etc.

Brig-schooner. A two-masted vessel with square-sails on the foremast and fore-and-aft sails on the main; an hermaphrodite brig.

Brill. The *Pleuronectes rhombus*, a common fish, allied to, but smaller than, the turbot.

Brine. A saturated solution of salt.

Brine-gauge. See SALINOMETER.

Brine-pump. A pump to draw off the super-salted water from a boiler.

Brine-valve. A blow-off valve.

Bring by the Lee. See BROUGHT BY THE LEE.

Bring 'em Near. A spy-glass.

Bringers Up. The men who are last in a boarding party. The rear-most men.

Bring Home. When the toggle becomes disengaged and the chip slips through the water the ship *brings home the log*. When in heaving up the anchor, the anchor *comes home*, the ship *brings home the anchor*.

Bringing-to Bolt. A bolt having an eye in one end and a nut and screw at the other; used in keying up a structure.

Bring the Sun Down. To bring in contact the horizon and the reflected image of the sun in a sextant or other instrument.

Bring-to. *To bring-to* a sail is to bend it to its yard or gaff. *To bring to* a messenger or cable is to put it around the capstan. *To bring a ship to* is to lie-to or heave-to or force another ship so to do. *To bring a ship to an anchor* is to let go the anchor. *To bring an enemy to action* is to force him to give battle.

Bring-up. To stop. A ship is *brought up* when her way is stopped either by letting go the anchor, or by running on a rock or shoal. *To bring-up with a round turn* is to stop the running of a rope by taking a round turn around a cavil or pin; figuratively used in speaking of doing anything effectually though abruptly. *To bring-up all standing* is to be stopped suddenly and without warning.

Briny. An adjective which, used as a noun, signifies the sea; as, plowing the *briny*.

Brisas. A northeast wind which blows on the coast of South America during the trades.

Brismak. A name among the Shetlanders for the excellent fish called tusk or torsk, the best of the cod kind (*Brosmus vulgaris*).

Bristol (England) is on the Avon, at its confluence with the Frome, 8 miles from Bristol Channel. It is one of the leading British ports in foreign trade. Large ships can ascend the river to the city, where spacious docks, quays, and ship-yards have been constructed. It is the fourth town in Great Britain in customs revenue. Pop. 190,000.

Brit. A fish of the herring kind (*Clupea minima*) from 1 to 4 inches long, found, at some seasons, in immense numbers, on the eastern coast of New England.

British-built Ship. A ship built in Great Britain or Ireland, Guernsey, Jersey, the Isle of Man, or some of the colonies, plantations, islands, or territories in Asia, Africa, or America, which, at the time of building, belonged to or were in possession of Great Britain; or any ship whatsoever which has been taken and condemned as lawful prize. See INTERNATIONAL LAW.

British Seas. The four seas which surround Great Britain.

Brittle-star. The common name of a long-rayed starfish (*Ophiocoma rosula*).

Broach. To pierce; to tap; as a cask, to draw off the fluid. *To broach a business*, to begin it.

Broach-to. To fly up into the wind. It generally happens when there is considerable sea on, and the ship is carrying a press of canvas with a good deal of after-sail set. When a ship sails with the wind aft, or on the quarter, the wind acts in the direction of the ship's course and the pressure on the sails is very much diminished. If from this position the ship suddenly presents her broadside to the wind, the sails, masts, and rudder will be endangered, and in extreme cases the ship may capsize or be forced down stern foremost. Broaching-to is generally occasioned by the difficulty of steering the ship; by the negligence or incapacity of the helmsman; or by an accident happening to the helm which renders it incapable of governing the ship. See BROUGHT BY THE LEE.

Broad Arrow (*Eng.*). The royal mark for government stores.

Broad-ax. See AX.

Broadcloth. Square-sails. A wide and superior article of woolen cloth, plain or twilled.

Broad-horn. An old name for a flat-boat on the Western rivers.

Broad of Water. An extensive lake with a channel communicating with the sea, or a wide opening of a river after passing a narrow entrance.

commerce of Buffalo is large and constantly increasing, a fact due to its location at the foot of the great chain of lakes, and to its being the terminus of the Erie Canal and of several railroad lines. Grain is the most important article of commerce, and the facilities for handling and storing it are unexcelled by those of any other city on the continent. Pop. 150,000.

Bug. An old term for a vessel more remarkable for size than efficiency.

Bugalilo. A large trading-boat of the Gulf of Persia; called *buglo* by sailors.

Bugazeen. An old term for calico.

Buggy-boat. A boat fitted with wheels for use as a vehicle on land.

Bugling. At the Naval Academy the bugle sounds a call to terminate each recitation, and when a midshipman has a problem which he is unable to solve, he sometimes remains at the blackboard until this call is sounded, trusting thus to evade the consequences of a poor recitation. This manœuvre is termed *bugling*.

Bugologist. Jack's term for an amateur entomologist.

Build. A vessel's form or construction.

Build a Chapel. To turn a vessel suddenly by negligent steering. See CHAPEL.

Builder's Certificate. A document containing an account of a ship's denomination, tonnage, where and by whom built, etc.

Built. A suffix to denote the construction of a boat or vessel; as, carvel-built, frigate-built, sharp-built, etc.

Built-block. A made block.

Built-up. An expression applied to masts or guns made of several pieces.

Bulch. To bilge.

Bulge. See BILGE.

Bulk. The greater part. Substances stowed without cases or packages are stowed *in bulk. To break bulk*, to commence discharging cargo.

BULKER. A person employed to measure goods, and ascertain the amount of freight with which they are chargeable.

Bulk-head. Any partition separating apartments on the same deck. Some are very strong, and others are light and can be removed at pleasure. *To bulk-head* is to carry on a conversation which is intended for the ears of a third party.

Bull. A male whale. Weak grog made by pouring water into a spirit-cask nearly empty. When the tide and wind cause the ship to bump up against her buoy she is said to *bull the buoy*.

Bull-dance. A stag-dance.

Bull-dogs. A general term for the main-deck guns.

Bullet. A small projectile, usually of lead, and either spherical or elongated, for use in the smaller kinds of fire-arms, such as muskets, rifles, carbines, and pistols. Formerly spherical bullets were made by melting lead and pouring it into molds. They are now made more expeditiously and more truly spherical by compression. The lead is first formed into a rod about a yard long by five- or six-eighths of an inch thick, which is passed between rollers for the purpose of condensing it; other rollers then press it into a row of nearly globular pieces, to each of which the proper form is given by means of a spherical die, after which a treadle-worked punch separates them into bullets. The spherical bullet is, however, rapidly becoming obsolete, having been almost entirely superseded by the elongated bullet, which encounters less resistance from the air, and has a longer range and greater penetrating power than the spherical. Several forms of the elongated bullet are used. In most of them the base of the bullet is made expansive either by being hollowed, or by being fitted with a wooden plug, so that the force of the powder shall dilate the lead and cause it to fill the grooves of the rifle. By this means the bullet acquires a rotatory motion around its long axis which tends to increase its range and precision. See EXPLOSIVE BULLET.

BULLET-COMPASSES. A pair of compasses with a ball on one leg to fit in a hole.

BULLET-LADLE. A ladle for melting lead for casting bullets.

BULLET-MOLD. An implement for shaping bullets.

BULLET-PROBE. An instrument for exploring tissue to find the situation of a bullet.

BULLET-SCREW. A screw on the end of a rammer for drawing a bullet from a fire-arm.

BULLET-SHELL. An explosive bullet.

Bull-head, or Bull-jub. A name of the fish called miller's thumb (*Cottus gobio*).

Bullion. Heavy twisted fringe for ornaments.

Bullock-block. A block formerly used under the topmast cross-trees for the topsail-ties.

Bullock-slings. Slings for hoisting in live cattle.

Bull's-eye. A small annular block of hard wood without a sheave; it has a groove to take a strap, and is measured by its diameter. A small circular cloud ruddy in the centre, a forerunner of a storm. The centre of a target. The lens of a dark lantern; hence the lantern itself. A small, thick, circular piece of glass inserted in the decks, port-lids, etc., for the admission of light. A popular name for the star Aldebaran (*a Tauri*).

BULL'S-EYE CRINGLE. A cringle worked around a bull's-eye.

Bull-trout. The salmon-trout of the Tweed. A large species of trout taken in the waters of Northumberland. The sea-trout.

Bullyrag. To reproach contemptuously, and in a hectoring manner; to bluster, to abuse, and to insult noisily.

Bulwark. The planking or wood-work round a vessel above the deck.

BULWARK-NETTING. An ornamental frame of netting answering the purpose of a bulwark.

Bumbard. A cask or large vessel for liquids. See BOMBARD.

Bum-boat. A boat employed to carry provisions, vegetables, and small merchandise for sale to ships. The name is corrupted from *bombard*, the vessel in which beer was formerly carried to soldiers on duty.

Bumkin, Bumpkin, or Boomkin. A short boom or beam of timber projecting from each bow of a ship. Its use is to extend the weather clew of the foresail. The name is also applied to the timber projecting from each quarter for the main-brace blocks.

Bummaree. A word synonymous with *bottomry* in maritime law. It is also a name given to a class of speculating salesmen of fish, not recognized as regular tradesmen.

Bump. To bump a boat is to pull astern of her in another, and insultingly or inimically give her the stem.

Bump-ashore. To run stem-on to a beach or bank. A ship bumps by the action of the waves lifting and dropping her on the bottom when she is aground.

Bumper. A log of wood over the side, used as a fender.

Bumpkin. See BUMKIN.

Bund. In the East, an embankment or sea-wall.

Bundle. To load things into a boat in a slovenly manner. *Bundle up!* Hurry up from below.

Bungle. To perform duty in a slovenly manner.

Bungo, or Bonga. A dug-out made from the bonga-tree.

Bung-starter. A stave or bat used for starting bungs by beating on the cask on either side of the bung. A sobriquet for the captain of the hold.

Bung-up and Bilge-free. A cask placed with the bung-stave uppermost, and the bilge clear of everything.

Bunk. A standing bed-place.

Bunker. A bin for stowing coal on board a steamer.

Bunt. The middle part of a sail. The sail which is tossed up on the centre of the yard in furling. A *high* bunt is formed when the bunt-whip is hauled taut-up and a great amount of sail is stowed in the exact centre of the yard; in a *low* or *rolling* bunt the sail tapers gradually from the centre.

BUNTERS. The men who stow the bunt.

BUNT-FAIR. Before the wind.

BUNT-GASKET. See GASKET.

BUNT-JIGGER. A small purchase for rousing up the bunt of heavy sails.

BUNT-WHIP. A whip for rousing up the bunts of the light sails in furling.

Bunting. A thin woolen stuff of which flags are made.

Buntline. One of sev[...]l ropes toggled to the foot of a sail and leadin[...] thence, before all, to blocks above the yard and thence to the deck. They are used for hauling the foot of the sail up to the centre of the yard.

BUNTLINE-CLOTH. A narrow lining on the forward surface of a sail in the wake of the buntline to protect the [...]il from chafe.

BUNTLINE-CRI[...]LE. A cringle worked into the foot-rope of [...]il to which the buntline was clinched. Crin[...] have been superseded by toggles.

BUNTLINE-S[...] A short piece of rope with a thimble in o[...] through which the buntline is rove; the [...]nd is made fast to the tie-block to keep [...] into the yard. It is generally called a [...]

BUNTLIN[...] A toggle seized to the foot-rope of [...] which the buntline is attached by a [...] When the sail is loosed to a bowline, th[...] are unbent from the bridles and are att[...]ese toggles.

Buoy. [...] body, commonly a water-tight cask, [...]lock of wood. They are attached t[...]n by a rope or chain, and serve to m[...]annel, or indicate the position of obj[...]e surface of the water; as, rocks, sho[...] etc. They are also used for other [...], life-preservers, floats for permanen[...] floats for the upper edge of a sein[...] are generally made of wood, or sheet-iron, but gutta-percha has sometimes been used. They are variously shaped and colored, and sometimes named and numbered, in order that they may be easily distinguished from each other. A *cone-* or *can-buoy* is conical in shape, a *cask-buoy* cylindrical or nearly so, and a *nut-* or *nun-buoy* is shaped like the frustrum of two cones with the bases joined together. A *spar-buoy* is a spar, one end of which is anchored. *Anchor-buoys* are attached to the anchors, and serve to mark out the position of the anchors, so that they may be avoided in tending ship, or picked up in case of being obliged to slip. A *bell-buoy* is a large buoy on which is placed a bell, which is sounded by the heaving and setting of the sea. A *whistling-buoy* is fitted with an apparatus which makes a peculiar whistling noise at certain stages of the tide or sea. *To buoy* an object is to indicate its position by means of a buoy and a rope or chain. *To buoy* the cable is to attach a buoy to the bight to keep it from sinking and chafing against the rocks. *To bleed a buoy* is to let the water out of it. A buoy *watches* when it floats on the water. *To stream the buoy* is to let an anchor-buoy fall from the bows previous to letting go the anchor.

Buoyancy. The quality of floating in a liquid. The weight of a floating body as measured by the volume of fluid displaced.

CENTRE OF BUOYANCY. See CENTRE.

Buoys, Directions for Coloring, Numbering, and Placing. UNITED STATES.—In conformity to the terms of the act of Congress, approved September 28, 1850, prescribing the manner of coloring and numbering the buoys along the coasts and in the bays, sounds, rivers, and harbors of the United States, the following order must be observed, viz.:

1. In approaching the channel, etc., from seaward, *red buoys*, with *even numbers*, will be found on the *starboard* side of the channel, and must be left on the *starboard* hand in passing in.

2. In approaching the channel, etc., from seaward, *black buoys*, with *odd numbers*, will be found on the *port* side of the channel, and must be left on the *port* hand in passing in.

3. *Buoys* painted with *red* and *black horizontal stripes* will be found on *obstructions*, with channel-ways on either side of them, and may be left on either hand in passing in.

4. *Buoys* painted with *white* and *black perpendicular stripes* will be found in *mid-channel*, and must be passed close-to to avoid danger.

5. All other distinguishing marks to buoys will be in addition to the foregoing, and may be employed to mark particular spots, *a description of which will be given in the printed list of buoys.*

6. Perches, with balls, cages, etc., will, when placed on buoys, be at turning-points, the color and number indicating on what side they shall be passed.

The following abbrevations are used on charts and buoy lists:

R., red buoys, Nos. 2, 4, 6, etc., starboard. B., black buoys, Nos. 1, 3, 5, etc., port. P. S., white and black perpendicular stripes, without numbers, in mid-channel. H. S., red and black horizontal stripes (on obstructions), without numbers.

BELGIUM.—On entering the channel from sea-

ward, *white* buoys must be left on the starboard hand, *black* buoys on the port.

CANADA.—The same as the United States.

ENGLAND.—The starboard side of a channel is the right-hand side proceeding from seaward. The entrance to a channel or a turning-point is marked by a spiral buoy, with or without staff and globe, triangle, cage, etc. Single-colored can-buoys, *black* or *red*, mark the starboard side, and buoys of the same shape and color, either checkered or vertically striped with *white*, mark the port side. Globes are used on buoys on the starboard hand, and cages on the port. When a middle ground exists in a channel, each end of it is marked by a buoy with horizontal *white* stripes. Wrecks are marked by *green* buoys. All buoys have their names painted on them in conspicuous letters.

FRANCE.—On entering a channel from seaward, all buoys and beacons painted *red* with a *white* band near the summit, must be left to starboard; those painted *black* must be left to port. Buoys that can be passed on either side are painted *red* with *black* horizontal bands. That part of a beacon below the level of high water, and all warping buoys, are painted *white*. The small rocky heads in frequented channels are colored the same as beacons when they have a surface sufficiently conspicuous. Each buoy or beacon has upon it the name of the danger it is intended to point out, and also its number, commencing from seaward. The even numbers are on the red buoys, and the odd numbers on the black. The buoys that can be passed on either side are named but not numbered.

HOLLAND.—The same as Belgium.

SCOTLAND.—Coming from seaward, leave the *red* buoys on the starboard hand, and the *black* buoys on the port. *Red and black* buoys are placed on detached dangers, and may be passed on either side. Wrecks are marked by *green* buoys. Fairway buoys are plainly marked, and all buoys have their names painted on them. Liverpool is buoyed on the same system.

BUOY-ROPE. The rope which attaches the buoy to the anchor; it should always be of sufficient strength to lift the anchor should the cable part.

BUOY-ROPE KNOT. A knot made by unlaying the strands of a cable-laid rope, and also the small strand of each large strand; and after single and double walling them, as for a stopper-knot, worm the divisions, and round the rope.

Burbot. A fish of the genus *Lota*, shaped like an eel, but shorter and thicker, with a flat head, having on the nose two small beards and another on the chin. Sometimes called an *eel-pout*.

Burden. The quantity of merchandise that a ship carries when properly trimmed. See TONNAGE.

Bureau. A department of government. In most European countries the highest departments of government receive the name of *bureaus*. In England and the United States the term is confined to subordinate departments, as Bureau of Ordnance. See ORGANIZATION.

Burgall. A fish of our eastern coasts, from 6 to 12 inches long; also called the blue-perch, the chogset, and the nibbler,—the last from its habit of nibbling off the bait thrown for other fishes.

Burgee. A swallow-tailed flag; in the merchant service it generally has the ship's name on it.

Burgomaster. In the Arctic Sea, a large species of gull (*Larus glaucus*).

Burgoo. A dish made of boiled oatmeal seasoned with salt, butter, and sugar.

Burgoyne, Hugh Talbot. Born in 1833. Only son of Sir John Burgoyne, Royal Engineers. He was a captain in the English navy. During the Crimean war, while still a junior officer, he commanded a small but active vessel. For his action at Kinburn he was made one of the first recipients of the Victoria cross. At the close of the war he was made Knight of the Legion of Honor, and received the order of Medjidie. After this he was rapidly promoted. He was lost while in command of the Coles turret-ship "Captain," which foundered off Cape Finisterre, September 7, 1870. The "Captain" had an extremely low free-board, and was built by Laird, of Birkenhead, under the supervision of her designer, Captain Coles, and Captain Burgoyne. During her first cruise, in May, 1870, Admiral Sir Thomas Symonds reported her as behaving extremely well in all weather, using her heavy guns readily in a seaway, very stable, and especially handy under sail. She capsized, however. Her constructor, Captain Cowper Coles, R.N., perished in her, with 542 out of 560 souls, who composed her complement.

The former chief constructor of the Royal navy, Mr. E. J. Reed, had always declared that the "Captain" was unseaworthy.—*E. Shippen.*

Burley-twine. A strong coarse twine.

Burnettizing. A process for the preservation of timber. The timber is immersed in a solution of chloride of zinc for a certain period, which depends upon the size of the timber.

Burn the Water. A phrase denoting the act of killing fish at night with a gig. The fishermen have a torch in the boat; hence the phrase.

Burr. The hazy c[illegible]le which appears around the moon before rain.

Burrel. Langrage shot, consisting of bits of iron, bullets, nails, etc., got together in haste for a sudden emergency.

Burrock. A small weir over a river, where weels are laid for taking fis[illegible].

Burr-pump. A name fo[illegible] the bilge-pump.

Burser. See PURSER.

Burster-bag. A bag for [illegible] bursting charge of a shell.

Bursting Charge. The [illegible]ice charge of a shell as distinguished from [illegible]lowing charge. In some shells the bursting [illegible] is inclosed in a bag as a guard against pr[illegible]e explosions.

Burt. A flat fish of the [illegible]kind.

Burthen. See BURDEN

Burton. A tackle used [illegible]us purposes; as, swaying aloft a topsa[illegible]ting a yard, etc. A *top-burton* is kept [illegible] the pendants at the topmast-head. It i[illegible]ckle, and is long enough to permit the [illegible]k and hauling part to come down to [illegible] The fall of the main top-burton is th[illegible]piece of rigging in a ship. See SPAN[illegible]N.

Burt's Nippers. An a[illegible]metimes attached to a deep-sea lea[illegible] allows the line to run readily throu[illegible]he lead is descending; but as soon [illegible] trikes the bottom, releasing the te[illegible] [illegible]ne at the surface of the water.

Bush. A perforated piece of metal let into certain parts of machinery to receive the wear of pivots, journals, etc. Any similar lining of a hole with metal; as, the vent of a gun. The bush or bushing of the vent of a gun is made of pure copper; the outer orifice is faced with steel, and the inner orifice, in heavy guns, is lined with platinum.

Bushing. See BUSH.

Bush-metal. An alloy of copper and tin.

Bushnell, David, of Connecticut, was the first to show practically that a charge of gunpowder could be fired under water, and is therefore entitled to the credit of inventing torpedoes or submarine mines (1775).

Busking. Piratical cruising. Beating to windward along a coast, or cruising off and on.

Buss. A small strong-built Dutch vessel with two masts, used in the herring and mackerel fisheries, generally of 50 to 70 tons burden.

Bust-head. See FIGURE-HEAD.

Busy as the Devil in a Gale of Wind. Fidgety restlessness, or double diligence in a bad cause; the imp being supposed to be mischievous in hard gales.

But. A conical basket for catching fish.

Butcher's Bill. A nickname for the official return of killed and wounded which follows an action.

Butescarli. The early name for the sea-officers in the British navy.

Butt. A wine measure of 126 gallons. The large end of the stock of a fire-arm. A target; hence a person at whom are leveled the shafts of sarcasm or ridicule. The joining of two timbers or planks endways; also the ends of the timbers or planks so joined. The largest end of any timber or plank. *To start* or *spring a butt* is to loosen the end of a plank by the laboring of the ship.

Butt-and-butt. A term denoting that the butt ends of two timbers meet but do not overlap.

Butter-box. A name given to the brig-traders of lumpy form, from London, Bristol, and other English ports. A cant term for a Dutchman.

Butter-bump. A name of the bittern.

Butter-fingered. Having a careless habit of allowing things to slip through the fingers.

Buttock. The after-part of the ship on each side below the knuckle. A ship is said to have a broad or narrow buttock according to her transom convexity under the stern.

BUTTOCK-LINES. Represented on the sheer draught as curve lines cutting the ship into vertical longitudinal sections parallel to the centre line.

Button. The knob of metal which terminated the breech-end of old guns, and which afforded a convenient bearing for the application of handspikes, breechings, etc.

Buttons, To Make. A common time-honored, but strange expression for sudden apprehension or misgiving.

Butt-shaft, or Butt-bolt. An arrow without a barb, used for shooting at a butt.

By. Being, or passing, near. *By the wind*, as near the wind as possible. *Full and by*, rap-full, but close to the wind. *By and large*, to the wind and off it. *Stand by!* Be prepared. *By the board*, over the ship's side; a mast carried away near the deck is said to go *by the board.* A ship is *down by the head* (or *stern*) when she draws more water forward (or aft) than she does when she is in her proper trim.

Bykat. A term for a male salmon of a certain age, because of the beak which then grows on its under-jaw.

Byllis. An old spelling for *bill.*

Byrth. The old expression for tonnage.

Byssa. An ancient gun for discharging stones at the enemy.

Byssus. The silken filaments of any of the bivalved mollusks which adhere to rocks, as the *Pinna*, *Mytilus*, etc. The silken byssus of the great pinna, or wing-shell, is woven into dresses. In the *Chama gigas* it will sustain 1000 pounds. Also, the woolly substance found in damp parts of a ship.

By-wash. The outlet of water from a dam or discharge channel.

C.

C. Abbreviation for *can* in the U. S. General Service Signal Code. Among the letters used in the log-book to register the state of the weather *c* denotes *cloudy*.

Caaing Whale (*Globicephalus deductor*). A cetacean belonging to the genus *Delphinus*, but differing from the other *Delphinidæ* in having the phalanges more numerous and the limbs lower and more approximated in position. It resembles the common porpoise in general form, but is much larger, measuring from 16 to 24 feet in length, and rather more than 10 feet in circumference at its thickest part, which is at the root of the dorsal fin, whence the body tapers towards the tail, which is deeply forked. In color it is black, with a white streak on the under side. Its pectoral fins are long and narrow. Its vertebræ number 55. It is very gregarious, and is found on the coasts of Great Britain, North America, and Iceland, while other species of the same genus exist in the South Seas and the North Pacific. It is most frequently taken on the Scottish coast, whence also it derives its name, the word "caaing" being Scotch for "driving." The animal is so called from the fact that owing to its sheep-like propensity to follow its leader, the fishermen, having hemmed in a herd between their boats and the shore, are enabled to drive the whole herd into shallow water, where, becoming stranded, they fall an easy prey, and form a rich booty to their pursuers.

Cabane. A flat-bottomed passage-boat of the Loire.

Cabin. In passenger steamers the cabin is a large apartment which is occupied by the better class of passengers. In it are the *state-rooms* or private rooms of the passengers, and the space between the rows of state-rooms is the *saloon*, which is for the accommodation of the passengers in general, and is frequently used as a dining-room. In large vessels there are two or three cabins, in which case they are occupied, respectively, by the first-, second-, and third-class passengers. In an ordinary merchant vessel the cabin is the apartment occupied by the master of the vessel.

In a man-of-war the cabin is the apartment occupied by the cabin-officers. Cabin-officers are the commanding officer and other line-officers of and above the grade of commander, whether they are on duty or attached to the ship as passengers. In large vessels there are two cabins, one on the main deck and one on the upper deck. The cabin is frequently divided into compartments by light bulkheads, and two or more state-rooms are formed in the same manner. When there is a flag-officer on duty on board a vessel having two cabins, he selects one for his own use and the commanding officer occupies the other; when there is but one cabin, the commanding officer is entitled to one-third of the space, divided off by a fore-and-aft bulkhead.

CABIN-BOY. A boy whose duty it is to wait on the officers and passengers in the cabin.

CABIN-LECTURE. A severe but private reprimand. See JOBATION.

Cable. A large strong chain, or rope made of hemp, manilla, or coir, used to retain a ship in place when at anchor. Rope for cables is cable-laid, to render it impervious to water, but the additional twist given in laying it up detracts from the strength, the cable-laid being 30 per cent. weaker than plain-laid rope of equal size. Cables vary in size from 10 to 26 inches. Rope-cable has been superseded by chain.

Chain for cables for the navy is manufactured at the Washington navy-yard. The utmost care is taken to procure good iron; each bar is tested, and the links are carefully welded. A cast-iron stud is inserted in each link, except those at the ends of the sections; the object of the stud is to strengthen the chain and keep it from kinking.

Chain-cables are 120 fathoms long, a shackle being introduced at each section of 15 fathoms, and a swivel at 7½, 37½, and 82½ fathoms. The object of the swivel is to keep the chain from getting full of turns.

Chain-cables are marked at the shop in the following manner: each shackle is marked across the eye with its number; the swivels and club-link are marked with the number of the chain, the date, place of manufacture, and the initials of the inspector.

On the stud are cast the initials U. S. and W. N. Y., and also the size of the chain in figures.

Table for Proof of Cables.

Size of Cable.	Pounds Strain Single Proof.	Double Proof for Triplets.
2¼ inch	147,800	295,600
2⅛ "	134,400	268,800
2 "	117,600	235,200
1⅞ "	100,800	201,600
1¾ "	87,800	175,600
1⅝ "	78,000	156,000
1½ "	66,600	133,200
1⅜ "	56,000	112,000
1¼ "	44,800	89,600
1⅛ "	34,600	69,200
1 "	26,800	53,600

Chain-cables differing 1-16 inch in size are not manufactured now.

The triplets are cut from the chain to be issued, and are tested to destruction, but must stand the double proof before breaking.

Cables issued to the service are pulled to single proof only.

After the cable has stood the required test given in the proof-table, it is examined by an expert, to see if there are any defects in the welding.

A *shot* of cable, two cables spliced together.

To pay out or *veer cable*, to let more cable run out of the hawse-hole. *To bitt the cable*, to take a turn with the cable around the bitts. *To stopper the cable*, to secure it by means of pieces of ropes, called stoppers, attached to the deck or bitt. (See STOPPER.) *To buoy the cable*, to attach buoys to the bight of the cable to keep it clear of the ground. *To coil a cable*, to lay it in fakes and tiers. *To bend a cable*, to clinch or shackle it to the ring of the anchor. *To range a cable*, to lay it along the deck in parallel lines. *To slip the cable*, to let go the inboard end and allow it all to run out. *Cable enough!* the cry from the forecastle when sufficient cable has been veered to allow the anchor to be catted.

CABLE-BENDS. Two small ropes for lashing the end of a cable to its own part, in order to secure the clinch, by which it is made fast to the anchor.

CABLE, BOWER-. The cable belonging to a bower-anchor.

CABLE-BUOY. A cask used to buoy up the bight of a cable.

CABLE, ELECTRICAL. An insulated wire or combination of wires used in telegraphy or in firing mines. The essential qualities are strength, pliability, and high insulation. The substances generally used for insulating a cable are gutta-percha, india-rubber, and Hooper's material; the latter is considered to be the best. To protect the insulating material from chafe over rocks, cables are generally provided with an external metallic covering.

CABLE-LAID ROPE. Three plain-laid ropes laid up into one rope, thus forming a nine-stranded left-handed rope.

CABLE, SHEET-. The cable belonging to the sheet-anchor.

CABLE'S LENGTH. One-tenth of a sea-mile, about 100 fathoms.

CABLE-STAGE. A platform in the hold on which are coiled the cables and hawsers.

CABLE, STREAM-. A hawser or large rope used with a stream-anchor.

CABLET. A cable-laid rope of less than 10 inches in circumference; a hawser.

CABLE-TIER. The place where cables and hawsers are stowed.

Cabon. An old word for a nipper.

Caboose, or **Camboose.** The cook-room or kitchen of merchantmen, on deck; a diminutive substitute for the galley of a man-of-war; the term is sometimes applied to a portable cast-iron stove used in coasting-vessels for cooking on deck.

Cabot, John. See CABOTO, GIOVANNI.

Cabot, Sebastian. One of the sons of Giovanni. He survived his father and brothers, and earned a high reputation as an explorer. Born at Bristol, England claims him as one of her sons. After the death of Henry VII. he entered the service of Spain, and became a member of the Council of the Indies. In the reign of Henry VIII. he commanded an expedition in search of the Northwest passage, "the dream of all the greatest navigators since the close of the fifteenth century." The object of the expedition was defeated by the pusillanimity of Admiral Pert. Cabot, however, turned the frustrated mission to account by observing the dip of the needle and the variation of the compass in those regions, and by forming plans for the accurate determination of the longitude. In 1520, Cabot left the service of the king of England, and accepted the grade of pilot-major under the government of Charles V. of Spain. By that monarch he was appointed captain-general of an expedition to Cape Horn and the Pacific shores of South America; but through the jealousy of his subordinates his operations were confined to the Rio de la Plata and its tributary streams. Withdrawing from the Spanish service in 1548, he once more settled in Bristol, and Edward VI. of England employed him in a capacity corresponding with that of a first lord of the Admiralty. As superintendent of the shipping and foreign commerce of England, Cabot destroyed the monopoly of a grasping company, and improved the public revenues by encouraging the principles of free trade. He then founded a Society of Merchant Adventurers, and in that capacity sent out ships with keels of lead as a precaution against the worm. Some years later he closed a useful life, and was posthumously panegyrized as the most scientific seaman of the age, and one of the gentlest, bravest, and best of men, who gave to Britain not only a large continent but the untold riches of the deep in the fisheries of Newfoundland and the Arctic Sea. He was, in fact, the father of free trade.

Cabotage (*Ital.*). Sailing from cape to cape along a coast, or the details of coast pilotage.

Caboto, or **Kaboto, Giovanni** (JOHN CABOT), obtained a patent from Henry VII., King of England, empowering him and his three sons to sail into the eastern, western, or northern seas, with a fleet of five ships, at their own expense, to search for islands, countries, provinces, or regions not before seen by Christian people; to float the English flag on any city, island, or continent that they might find, and, as vassals of the English crown, to possess and occupy the territories so discovered. The expedition sailed from Bristol, May, 1497, and the Cabots sighted Labrador. In the following year they made a second voyage, and got as far as Maryland, having previously discovered Newfoundland. In 1499 they made a third voyage, extending to the Gulf of Mexico. See SEBASTIAN CABOT.

Cabral, or **Cabrera, Pedro Alvarez,** the discoverer of Brazil, was descended from an old and patrician Portuguese family. Nothing is known of his early life save the fact that he must have recommended himself by talent and enterprise to King Emanuel, of Portugal, who, after the first voyage of Vasco de Gama, appointed Cabral to the command of a fleet of 13 vessels, carrying 1200 men, and bound for the East Indies. On the 9th of March, 1500, he sailed from Lisbon. To avoid the inconvenience of being becalmed on the coast of Africa, he took a course too far westerly, fell into the South American current of the Atlantic, and was carried to the unknown coast of Brazil, of which he claimed possession for the king of Portugal, April 24, 1500, naming the new country "Terra da Santa Cruz." After sending home one vessel to bear news of this great accidental discovery, Cabral sailed for India; but on the 29th of May four of his vessels foundered, and all on board perished, including Diaz, the great navigator; and soon afterwards three more vessels were lost. Cabral therefore landed at Mozambique, on the east coast of Africa, of which he

first gave clear information, and also discovered (August 23) the Antschedives Islands, of which he described correctly the position. Hence he sailed to *Calicut*, where, having made the terror of his arms felt, he was permitted to found a factory; entered into successful negotiations with native rulers, and thus established the first commercial treaty between Portugal and India. He returned from India, bringing with him a considerable booty, and arrived in the port of Lisbon July 31, 1501. It appears probable that the king was dissatisfied with the results of the expedition (although it had annexed Brazil to the crown of Portugal), for subsequently we find no mention made of Cabral among other discoverers. At the request of Cabral, Sancho de Toar wrote a description of the coast of Sofola. Cabral's voyages are described in Ramusio's "Navigatione e Viaggi," 3 vols. (Venice, 1563; new ed., Venice, 1835.)

Caburn. A small line made of spun-yarn, for worming cables, seizings, and the like.

Cacao (*Sp.*). The plant *Theobroma*, from which cocoa is derived.

Cache (*Fr.*, a place of concealment). Explorers and other travelers in waste regions wishing either to disencumber themselves of a portion of their *impedimenta*, or to establish magazines for use on their return journey, frequently bury in the ground provisions and articles of equipment. The place of such a deposit is termed a *cache*, and the process of making it, *cacheing*.

Cacholot, Spermaceti, or Sperm Whale (*Physeter macrocephalus*, or *Catodon macrocephalus*). One of the largest of the *Cetacea* (which see), and of very peculiar form. Unlike the right whale, it affords no whalebone, but is much sought after, not only on account of the oil, but still more for the spermaceti and ambergris which it yields. It is widely distributed geographically and inhabits nearly all seas, but is most abundant in those of the southern hemisphere. It sometimes attains the length of 70 or 80 feet. The general color is very dark gray, nearly black on the upper parts but lighter beneath. Old males, or, as the South-Sea whalers call them, old bull-whales, usually have a large gray spot on the front of the head. The head is enormously large, forming about one-half of the entire bulk of the animal, and taking up more than one-third of the whole length. From the head the body tapers to the tail, and at last rather rapidly. The muzzle is very obtuse, almost as if suddenly cut off in front, the breadth of it almost equaling the thickness of the body. In a protuberance on the upper part of it is the blow-hole, which is single, situated a little on the left side, and in form not unlike the letter S elongated. The mouth is very wide, and the throat, unlike that of the Greenland whale, is sufficiently capacious to admit the whole body of a man. The upper jaw projects some feet beyond the lower, and has neither teeth nor whalebone; but the lower jaw contains twenty or twenty-five teeth on each side, according to the age of the animal. The teeth, which are conical and slightly recurved, project about two inches from the gum. The lower jaw is very narrow, its two branches being for most of their length in contact; it fits into a groove in the upper jaw, in which are cavities for the teeth. The eyes are small and placed far back in the head above the angles of the mouth; the left eye is said to be smaller than the right. Just above the eyes the dorsal line rises considerably; the dorsal fin is also represented by a protuberance about half-way between the neck and tail, and these parts are seen above water in the ordinary swimming of the animal, which is at the rate of from 3 to 7 miles an hour and just beneath the surface of the water, although when alarmed it swims more swiftly and strikes the water with its tail upward and downward with great force. The pectoral fins are small, and seem scarcely, if at all, to aid in progression, which is accomplished by the large and powerful tail-fin. The tail-fin is very broad and is divided into two lobes, called by the South-Sea whalers the *flukes*. The head of the cacholot is in great part occupied by a cavity in front of and above the skull, called by whalers the *case*, which is a receptacle for spermaceti (which see). This substance being light, the animal in swimming raises its head above the surface of the water, which it also does when at rest. The case frequently holds not less than ten large barrels of spermaceti. It is not formed of bone, but of a strong tendinous integument, and is divided into compartments which communicate with each other. The substance which it contains is in a semi-fluid state, but hardens on cooling; it consists of spermaceti and oil. The oil is separated by drawing and squeezing, and the spermaceti further purified till, instead of being a yellow, unctuous mass,—the state in which it is brought home by the whalers,—it assumes a beautiful pearly white, flaky, nearly crystalline appearance. When the spermaceti whale is killed and towed alongside the whaling-ship, the case is emptied of its valuable contents through a hole made in front of the muzzle, and by means of a basket attached to a pole. The spermaceti used to be considered the brain of the whale; what purpose it serves is not known, except that already alluded to of giving buoyancy to the fore part of the animal, and perhaps this is its chief use, respiration even more than progression depending on it. It is distinct enough from the brain, which, as well as the skull that contains it, is very small compared with the bulk of the creature. Cavities filled with spermaceti are distributed over the body, and even ramify through the external fat or blubber, although the principal mass is in the head. The blubber of the cacholot is not nearly as thick as that of the Greenland whale, being only about 14 inches in thickness on the breast of a large whale, and from 8 to 11 inches on other parts of the body. It is called by whalers the *blanket*, is removed from the captured whale in great strips, and is heated in large pots, the skin of the whale serving for fuel, when the oil—known as sperm oil (which see)—flows from it. The *junk*, a thick elastic mass, which occupies the fore part of the head immediately under the case, yields also a considerable quantity of sperm oil. The cacholot feeds principally upon squids and cuttle-fish. It goes in herds, which are called *schools* by the sailors. Large herds consist generally of females with only a few males; herds of young males also occur. When solitary individuals are met with, they are almost always old males. Terrible conflicts often take place among the males, and it is not unusual to find the lower jaw dislocated or broken as a result of these encounters.

Cade. A small barrel of about 500 herrings or 1000 sprats.

Cadence. The regularity requisite in pulling. A uniform time and pace in marching indispensable to the correct movements of troops.

Cadet. A French word signifying younger, junior. This term is also applied in France and other countries to a student in the art of war and military science.

CADET ENGINEER. The lowest grade of the engineer corps in the U. S. navy; so called during their state of pupilage at the Naval Academy and up to the time of their promotion to assistant engineer.

CADET MIDSHIPMAN. The lowest grade of line-officers in the U. S. navy; so called while pupils at the Naval Academy and during a probationary period of sea service, at the expiration of which they are promoted to midshipman. See ACADEMIES, NAVAL.

Cadge. To carry. Kedge may be a corruption.

Cadiz. A city and seaport of Spain, capital of the province of Cadiz, on the island of Leon, off the S.W. coast of Andalusia, 60 miles N.W. of Gibraltar, and 64 miles S. of Seville. Lat. 36° 32′ N.; lon. 6° 17′ 15″ W. It stands on a narrow tongue of land, which projects about 5 miles N.N.W. into the sea; it is surrounded on three sides by water, and is strongly defended both by nature and by art. The entrance to its capacious bay is commanded by forts, while on the other sides large vessels cannot approach within three-fourths of a mile of the city. One of the most conspicuous objects in Cadiz is the light-house of San Sebastian, 172 feet in height. The bay, which is formed by the peninsula and the mainland, is spacious, and affords good anchorage. *La Caraca*, the royal dockyard, is situated at the bottom of the inner bay, about 6 miles from the city, and is defended by the cross-fire of two forts. It contains 3 spacious basins, and 12 docks or slips. The trade of Cadiz is less extensive than formerly. The chief article of export is sherry wine. Salt is another article of export. The chief imports are staves, tobacco, hides, cacao, indigo, cochineal, dye-woods, sugar, codfish, and coals. Pop. 58,000.

Cælum. See CONSTELLATION.

Caffila. See KAFILA.

Cag. See CARRY.

Cage. An iron cage, formed of hoops, on the top of a pole, and filled with combustibles. It is lighted before high water, and marks a channel, navigable for the period during which it burns.

Cage-work. An old term for a ship's upper works.

Caique, or Kaique. A small Levantine vessel. Also, a graceful skiff, seen in perfection at Constantinople, where it almost monopolizes the boat traffic. It is fast but crank, being so narrow that the oars or sculls have their looms enlarged into ball-shaped masses to counterbalance their outboard length. It has borne for ages the wave-line, which, upon its introduction into our marine architecture a few years ago, was esteemed a novelty. It may have from one to ten or twelve rowers.

Cairban. A name in the Hebrides for the basking-shark.

Cairn. A pile of stones used as a mark in surveying.

Caisson. A boat-gate, having generally both ends similar in form to the bows of a vessel, used to close the entrance to a dock or basin. An apparatus for lifting a vessel out of the water for repairs or inspection. It is usually a hollow structure sunk by letting water into it. There is an air-chamber inside, which allows it to sink only a certain depth. In that state it is hauled under the ship's bottom, the traps or openings are closed, the water is pumped out, and the caisson rises with the ship upon it. In another arrangement, a platform is sunk to a certain depth in the water, and is suspended by iron screws from a strong wooden framework; the ship is floated upon the platform, steadied by shores, and lifted high and dry by means of levers, wheels, pinions, and screws. In military matters, an ammunition-chest and the wagon on which it is carried. The term is also applied to a chest loaded with explosives and buried deep in the ground under a fortification for the purpose of being blown up if the enemy approach and take possession of that particular part of the work.

Calais. A town of France, department of Pas-de-Calais, on the Strait of Dover, 26 miles E.S.E. of Dover, and 20 miles N.E. of Boulogne. Lat. of the new light-house, 50° 57′ 45″ N.; lon. 1° 51′ 18″ E.; height, 192 feet. The tower and harbor are defended by a castle and several forts, and by means of sluices the whole adjacent country may be laid under water. The harbor is formed by two moles, which are continued seaward by wooden piers, the whole being about three-fourths of a mile in length. At ebb-tide it is nearly dry; has not a greater depth than 15 or 18 feet at high water. A tower in the centre of the town serves as a light-house. There is good anchorage ground 2 to 3 miles N.W. of the harbor. Pop. 20,000.

Calais, a city of Washington Co., Me., is on the St. Croix River. It is at the head of navigation, about 12 miles from Passamaquoddy Bay, 82 miles E.N.E. of Bangor, and 27 miles N.N.W. of Eastport. Pop. 6000.

Calamary (*calamus*, a pen). A Cephalopod, which derives its name from the fact of its body containing a *gladius*, or internal shell, shaped like a quill, and a bag in its visceral sac from which it diffuses an ink-like fluid. Its mouth is furnished with eight arms. The different species are distributed over all parts of the world, but are much more abundant in some seas than in others; they form a principal part of the food of some of the larger fishes and of whales. It is the *Loligo vulgaris* of Cuvier.

Calamine. An ore, consisting essentially of silicate of zinc. Its primary form is a rhomboid, and it occurs in small obtuse-edged crystals, also compact and massive. It is white, yellowish white, brown, green, or gray; is sometimes opaque, sometimes translucent, is brittle, and has an uneven conchoidal fracture. It occurs in beds and veins in rocks of various kinds, but most commonly in limestone.

Calanca. A creek or cove on the Italian and Spanish coasts.

Calcutta, capital of British India and of Bengal, is situated on the E. bank of the Hoogly River, 80 miles from the sea, in lat. 22° 33′ 47″ N., lon. 88° 23′ 34″ E., opposite the town of Howrah, to which a floating-bridge extends.

Calcutta is the largest emporium of trade in Asia, being the natural outlet of the valleys of the Ganges and Brahmapootra. The chief exports are jute, opium, indigo, rice, hides, raw silk, saltpetre, etc., and the chief imports are cotton, linen, and silk goods, hardware, wines, spirits, and salt. Pop. city proper, 448,000; including suburbs, about 900,000.

Calendar (Lat. *calendæ*, the first day of each month, from *calāre;* Gr. *kalein*, to call, to summon). The regulation, arrangement, and register of civil time. The natural unit adapted to the immediate wants and ordinary occupations of man is the *solar day*, or the period elapsed between two successive arrivals of the sun at a given meridian. It varies in length at different seasons of the year; but the variation is socially unimportant, and the tacit adoption of its *mean value* from the earliest ages arose probably from ignorance that such fluctuation existed. This *mean solar* or *civil* day is divided into 24 hours. The unit for longer duration again is naturally the period in which recur the seasons on which depend all the vital business of life. It is the interval between two successive arrivals of the sun at the vernal equinox, and is called the *tropical year*. This period varies slightly, and is incommensurate with the lesser unit, its length being about 365 days 5 hours 58 minutes 59.7 seconds. Now, if the odd hours, minutes, etc., were to be neglected, and the *civil year* made to consist of 365 days, the seasons would soon cease to correspond to the same months, and would run the round of the whole year; this odd time must therefore be taken account of. But then, again, it would be very inconvenient to have the same day belonging to two different years. To obviate this difficulty, a very neat contrivance was inaugurated by Julius Cæsar. He introduced a system of *two* artificial years, one of 365 and the other of 366 integer days; three consecutive years of 365, and then a fourth year of 366 days. The longer years were called "bissextile" or "leap-years," and the surplus days formed of the accumulated fractions and thrown into the reckoning were called "intercalary" or "leap-days." This calendar made the average length of civil years 365 days 6 hours, which was only a rough approximation to the truth, and the error soon accumulated to a whole day. A reformation was effected by Pope Gregory XIII.; and his law for regulating the succession of the two artificial years (of 365 days and 366 days) is such, that during the lapse of at least some thousands of years the sum of these integer-day years shall not differ from the same number of real tropical years by a whole day. For the period of 10,000 years the average length of the Gregorian year is 365.2425 days, which is a very close approximation to the mean tropical year, 365.242264 days (according to Delambre's tables). The Gregorian rule is as follows: The years are denominated as years *current* (not as years *elapsed*) from the midnight between the 31st of December and the 1st of January immediately subsequent to the birth of Christ, according to the chronological determination of that event by Dionysius Exiguus. Every year whose number is not divisible by 4 without remainder consists of 365 days; every year which *is* so divisible, but is not divisible by 100, of 366 days; every year divisible by 100, but not by 400, again of 365; and every year divisible by 400 again of 366 days. The principle might be applied further, and any degree of approximation attained. In our calendar the year is arbitrarily divided into 12 unequal months, the intercalary day being placed at the end of the shortest.

Calf. A word generally applied to the young of marine mammalia, as the whale. *Calf*, in the Arctic regions, a mass of floe-ice breaking from under a floe, which when disengaged rises with violence to the surface of the water; it differs from a tongue, which is the same body kept fixed beneath the main floe. The iceberg is formed by the repeated freezing of thawed snow running down over the slopes, until at length the wave from beneath and weight above causes it to break off and fall into the sea, or, as termed in Greenland, to calve. Thus, berg, is fresh-water ice, the work of years; the floe, is salt water frozen suddenly each winter, and dissolving in the summer.

Calf, or Calva. A Norwegian name, also used in the Hebrides, for islets lying off islands, and bearing a similar relation to them in size that a calf does to a cow; as, the Calf at Mull and the Calf of Man.

Calfat. The old word for calking. (*Calfater*, Fr.; probably from *cale*, wedge, and *faire*, to make.) To wedge up an opening with any soft material, as oakum. (*Calafatear*, Sp.)

Caliber, or Calibre. The diameter of the bore of a gun, cannon-shot, or bullet. A ship's calibre means the known weight her armament represents.

Calipash. The upper shell of a turtle.

Calipee. The under shell of a turtle.

Calipers, or Caliper Compasses. Bow-legged compasses used to measure the girth of timber, the external diameter of masts, shot, and other circular or cylindrical substances. Calipers of the best sort are made with a scale, having different sets of numbers engraved on it, like a sliding-rule, for the purpose of exhibiting at once various relations depending on the magnitude of the diameter of the body measured. Thus, as the weights of balls of the same metal are in a constant ratio to the cubes of their diameters, the scale may be so graduated and numbered that the observer may read off either the diameter in inches or the weight in pounds. Other numbers having a less immediate application are also frequently attached; for example, the degrees of a circle, the proportions of troy and avoirdupois weight, tables of the specific gravities and weights of bodies, etc. It is obvious that these may be varied infinitely according to the purposes proposed to be accomplished. Also an instrument with a sliding leg used for measuring the packages constituting a ship's cargo, which is paid for by its cubical contents.

Calk. To drive oakum into the seams between the planks in the sides and decks of a vessel, in order to prevent the entrance of water. The seam is first widened as much as possible, and the oakum is then forced in thread by thread. The oakum is driven until it forms a dense mass, when the seam is payed or coated over with hot pitch. The first people to make use of pitch in calking were the inhabitants of Phæacia. Wax and resin had been previously used, and a kind of unctuous clay has been made use of for the

same purpose. In the East a very hard cement, known as *chunam*, is used for the seams of vessels. *To calk* also means to sleep on deck with clothes on.

CALKER. One who calks and pays seams.

CALKER'S SEAT. A box slung to the ship's side whereon a calker sits when calking. It contains the calker's tools and oakum.

CALKING-BUTT. The opening between the ends of planks when worked for calking.

CALKING-IRONS. Peculiar chisels used in calking; there are several kinds, as the calking-iron, the making-iron, the rasing-iron, and the reeming-iron.

CALKING-MALLET. The wooden mallet or beetle used in driving the calking-irons.

Call. A signal made by a drum, bugle, trumpet, or boatswain's pipe. A peculiar silver whistle or pipe used by the boatswain and his mates to summon the men to their stations and to direct them in their various duties. This is done by sounding various strains, each of which is a signal to do a particular thing; as, belay, veer, walk away, sweep down, etc. The act of winding this instrument is called *piping*. In early times a gold call and chain was the badge of an admiral.

Calliope. An instrument which consists of a series of steam-whistles toned to produce musical notes; the valves by which steam is admitted to the whistles are operated by keys arranged like those of an organ. It is sometimes placed on the hurricane-deck of steamboats on the western rivers.

Call the Watch. The order to turn out the watch below to relieve the watch on deck. See WATCH.

Calm. A word used to denote the state of the weather when there is no perceptible wind. It is characterized as being *flat*, *dead*, or *stark*. In a calm, under canvas, it is customary to haul up the courses, brail up the trysails, counter-brace, and wait for a breeze. When two vessels are very near each other in a calm their heads should be kept in different directions, otherwise they would collide, on account of the attraction between the two bodies and the undulating motion of the sea, which causes vessels to forge ahead even in a calm. For the same reasons a vessel becalmed near the land should keep her head to seaward. A heavy cannonading will sometimes occasion a calm, and a large fire will cause a breeze to spring up, the wind coming in from all directions towards the fire.

CALM LATITUDES. The tract of ocean between the northeast and southeast trade-winds. Its situation varies several degrees, depending upon the season of the year. The term is also applied to the calm belt on the polar side of the trades. (See HORSE LATITUDES.) The calm latitudes were almost as much dreaded by the mariner as the region of storms. During a calm of many weeks food and water were likely to be exhausted at a point too far from land for a boat to reach it. Since the introduction of steam and the apparatus for distilling water, the calm belts have lost the greater portion of their terrors.

Calorimeter. An instrument for measuring quantities of heat. It consists essentially of a vessel containing a known weight of some convenient liquid, such as water or mercury; a thermometer for indicating the temperature of that liquid; and, if necessary, an agitator for making the liquid circulate. Experiments are performed by immersing in the liquid or mixing with it a known weight of the substance to be experimented on, at a known temperature different from the temperature of the liquid, and noting the common temperature of the liquid and the immersed substance when equilibrium of temperature is restored, taking care that all losses of heat, and other sources of error, are ascertained and accounted for.

This term is sometimes, though improperly, applied to the cross sectional area of boiler tubes.

Cam, or Wiper. In mechanism, a device by which any desired variety of relative motion may be obtained. It consists of either a continuously rotating or an oscillating body which, by the shape of its face or edge, or by a groove in its side or face, drives a sliding or turning piece either with constantly varying, regular, or intermittent motion. It is extensively used in fabricative machinery, such as the printing-press or sewing-machine. In steam-engines it is applied only to valve-gear.

CAM-SHAFT. A shaft carrying a cam.

CAM-ROLLER. A roller that acts on the face or in the groove of a cam.

CAM-WHEEL. A wheel driving or carrying one or more cams, and which may, by itself, communicate a motion different from that of the cams.

Cambala. Marco Polo's name for Pekin.

Camber. In ship-building, a term for anything which rounds, but chiefly to express the camber to the ways for the launching of a ship.

CAMBER-KEELED. Having the keel arched upwards, but not actually hogged.

Camboose. See CABOOSE.

Camden. A city and port of entry, capital of Camden Co., N. J., on the Delaware River, opposite Philadelphia. Its river front extends from Cooper's Creek on the north to Newton Creek on the south. Cooper's Creek is navigable beyond the city limits. Pop. 37,000.

Camel. A water-tight structure placed beneath a vessel in the water to raise it. Camels were invented by the Dutch, about 1688, for carrying vessels into harbors where the depth of water would not otherwise permit them to enter. They consisted of two large water-tight boxes or half ships, built in such a manner that they could be applied to each side of the hull of a vessel. When about to be used water was allowed to run into them, and when they sank to the required depth they were firmly secured to the ship's hull. The water was then pumped out, and the camel rose, bringing up the vessel with it. The camels in use in Holland are upwards of 100 feet in length and 20 feet in breadth.

Camels are frequently used to raise sunken bodies.

Cameleopardalis. See CONSTELLATION.

Camfer. See CHAMFER.

Camock. A very early term for crooked timber.

Campeachy. A town of Mexico, capital of the state of Campeachy, on the bay of the same name, 90 miles S.S.W. of Merida. Lat. 19° 50′ N.; lon. 90° 33′ W. The harbor is capacious but shallow, and vessels drawing more than 6

feet of water are compelled to anchor 3 miles from the shore. Notwithstanding this disadvantage, vessels measuring 100 feet of keel are built here. Pop. 18,500.

Canaiche, or Canash. An inner port, as at Granada in the West Indies.

Canal. An artificial channel filled with water, formed for the purposes of inland navigation. The section of a canal is usually a trapezium, of which two sides are parallel and horizontal and the other two equally inclined to the horizon. The inclination depends on the nature of the soil. It is least in tenacious earth and greatest in loose soil; but no soil will maintain itself unless the base of the slope exceeds its height at least in the ratio of four to three. In loose soil the base requires to be twice as great as the height. A canal is usually confined between a bank on one side and a towing-path on the other. The bed of a canal must be absolutely level, or have no more slope than is necessary to convey water to replace that which has been wasted. Hence, when a canal intersects a sloping country in a series of channels at different levels, means must be provided to enable vessels to pass from one level to another. This is commonly effected by means of a lock (which see). See Canals, Interoceanic.

Canal-boat. A large boat generally decked and towed by horses.

Canals, Interoceanic. The Suez Canal is the only one completed or even under construction. Those proposed and based on surveys sufficient to establish their practicability are *via* Nicaragua and *via* Panama, to connect the waters of the Atlantic and Pacific Oceans.

The Suez Canal is a little over 99 miles in length, connecting Port Said on the Mediterranean and Suez on the Red Sea. It follows certain lines of depression known as Lakes Menzaleh, Ballah, Timsah, and the Bitter Lakes, which form a length of about 60 miles. These parts required only partial excavation, leaving 40 miles of canalization through full excavation, and with a summit of only 60 feet above the mean ocean-level.

The aggregate superfice of the lakes named is near 300 miles. Lake Menzaleh lies 6 miles from Port Said, and Ballah 29 miles. The Bitter Lakes are 12 miles from Suez: these natural reservoirs equalize tidal flow and confine any rapid current between the sea and the first natural reservoir. The charts give 6 to 18 inches tidal action at Port Said, and 5 feet at Suez.

The excavation required to obtain a depth of 26 feet was 75,000,000 cubic metres, almost wholly in loose sand and clay. The estimated cost was 162,000,000 francs, and to meet all supposed possible contingencies 200,000,000 was named. The actual capital and indebtedness, January 1, 1879, was very nearly 524,000,000 francs. The draft of vessel allowed is 25 feet; the rates of toll established are 10 francs for each passenger, and 10 francs per ton on measurements designed to represent the net tonnage, to which are added pilotage, towage, and other charges, usually increasing the cost of transit 10 per cent.

In 1877, 1663 vessels, of an average of 2055 tons, passed through; in 1879, 1477 vessels, of an average tonnage of 2190; in 1878, 1593 vessels passed, of which 25 were sailers. The decrease of tonnage between the years named will be observed.

In the Red Sea and the upper Mediterranean heavy short blows are frequent during the winter, and calms prevail in the summer. As a result, in 1876 nearly 60 per cent. of the English vessels trading to India and to Malasia pursued the route by the Cape of Good Hope. The tolls and income of the canal for 1879 were 32,209,493 francs.

The absence of fresh water along the line of the canal was a great discouragement and caused considerable expense until the fresh-water canal from the Nile was completed, and the drifting sands of the desert were partially arrested by vegetation, which became possible through irrigation. The extensive works necessary for the formation of Port Said was the most formidable difficulty encountered, and it is possible of maintenance only by constant dredging, involving large expenditures. The favorable conditions were the almost entire absence of rain-fall, being a mean of an inch and one-third yearly at Cairo, the existence of inconsiderable tides, and the small amount of hard material to excavate. The easy slopes and low grounds, as well as the absence of heavy rain-falls, made the deposition of the excavated material easy; in general, by very powerful dredging-machines, elevating the earth sufficiently to deposit it, through the aid of sluices, where it would be permanent.

The Nicaragua Canal as projected by Commander E. P. Lull, U.S.N.—The proposed canal as located requires the construction of two harbors, one at Greytown, the other at Brito, on the Pacific. In the construction of these harbors a liberal estimate of cost is proposed, but that part is the only uncertain element of cost of the canal; the plans have received the careful examination and approval of able engineers on the estimate of cost as given.

The distance apart of these harbors, following the line as located, is 181¼ miles; the summit-level is Fall Lake, 107.6 feet above mean ocean-level. From Greytown to slack-water navigation of the San Juan River is 42 miles, and estimate of cost $13,390,000. Recent instrumental examinations insure a decrease in distance of 7 miles, with a proportionate decrease in the estimate of cost.

The slack-water navigation begins above the mouth of the San Carlos River, and continues a distance of 63 miles to Lake Nicaragua. As located, four dams are required of a mean height of 29½ feet, and an aggregate length of 3960 feet; the natural foundations are good. Three natural canals around the dams have an aggregate length of 3½ miles. Between a point 6 miles from Greytown and Lake Nicaragua a lockage of 107.6 feet has to be effected. A certain amount of blasting and dredging is proposed in the bed of the San Juan for slack-water navigation. Recent examinations have led to the consideration of making only two dams, and thus reduce subaqueous work and lateral canalization.

The lake navigation extends 56½ miles, and the estimated cost of its improvement is $715,660.

The distance from Virgin Bay to the Pacific is 16⅝ miles by the Rio del Medio route. Recent investigations assure the diversion of the head-waters of the Rio Grande into the lake, thus securing a satisfactory surface-drainage and a

cutting of only 43 feet above the lake by the Lajas route. The descent involves 10 locks, as now proposed, of equal lift, and a tide-lock at Brito, where the spring-tides are 8 feet.

Summarized, the actual canalization required is 52 miles; slack-water navigation on the river San Juan, 63 miles; lake navigation, unimpeded except as above stated, 56½ miles; cost as located, \$52,577,718; with 25 per cent. contingent, \$65,722,147. The improved location reduces estimate for labor \$7,000,000.

The mean annual rain-fall, with not very extended observations, is 83 inches, with a dry season extending from December to April. The probable time required to construct the canal is five years. Excellent stone, lime, and cement, as well as timber, are in abundance and convenient. Lake Nicaragua has a superfice of 2800 miles, and an outflow twenty times as great as could be required for lockage. The trade-winds extend to the ports almost without interruption, making the proposed canal easy for the passage of sailing-vessels.

To such persons as have given little attention to an American interoceanic ship-canal, an inspection of a globe will at once show its importance to the inhabitants of the northern hemisphere, and at the same time the advantage that will be derived through being able to pursue routes in belts of prevailing fair winds by making slight detours for the purpose.

The Panama Route as developed by the surveys of Commander E. P. Lull, U.S.N.—The proposed route as located extends from Aspinwall to Panama, a distance of 41¾ miles. The canal has a summit-level of 124 feet, and derives its water-supply from the upper Chagres, crossing that river at summit-level by means of an aqueduct 1900 feet in length. The height at which the canal should cross the Chagres was determined as a necessity to avoid extraordinary floods, but this height appears to be four feet less than would be found necessary to secure the safety of the aqueduct from such floods as those of November, 1879.*

The proposed feeder is 10¼ miles in length, and, with dam and appliances, the estimated cost is \$10,366,899. At the time of locating the canal the water-supply was supposed to be unusually low, but still entirely sufficient for purposes of lockage. In March, 1878 and 1880, the water-supply was inadequate.

As planned there are 24 lift-locks of 10½ feet each, and a tide-lock at Panama, where the tides reach 22 feet. At Aspinwall the tide is nominal.

The estimated cost for labor and material, made on a common basis for the Nicaragua Canal, is \$75,609,108, and with 25 per cent. contingent, \$94,511,360. Commander Lull remarks the absence of all material for construction except timber.

The average yearly rain-fall is 124 inches. In 1872 it was 170 inches. The dry season extends usually from January to about the middle of April.

The Panama Canal à niveau of M. de Lesseps.—Accompanying a "circular" addressed by M. de Lesseps to American bankers is a "Report of the International Technical Commission appointed to examine the definite work required for the construction of the Panama Canal." This title is, perhaps, given from the fact that the engineers employed by M. de Lesseps were of different nationalities. The report is dated Panama, February 14, 1880, and in substance is as follows:

1. On the line of levels of the Panama railroad, as a base, 58 cross-sections have been taken. Several curves of 2000 metres radius have been adopted.

2. Fifteen borings had been taken on the line of the canal and on the line of the proposed dam at Gamboa; these borings were from a depth of from 12 to 22 metres.

3. It has been determined to adopt a slope of 1 to 1, except in the summit division in rock, where ¼ to 1 is considered sufficient.

4. It is proposed to overcome the difficulties presented by the river Chagres by the construction of a dam at Gamboa, situated between Matachin and Cruces. "The commission expresses the opinion that a dam 40 metres in height would provide for the storage of a volume of water of one thousand millions of cubic metres, a quantity equal to the maximum estimate of the flood of November 25, 1879 (the greatest that has ever been recorded), as given by Colonel G. M. Totten. This work will be completed by the construction of a new channel for the regulated flow of the river from the Gamboa dam to the sea. Another similar but narrower channel will be provided on the opposite side of the canal, for the stream and drainage on that side."

5. The commission deems it necessary to provide at Panama a tide-lock at the outlet, so as to preserve a constant level in the canal, and on the Atlantic side, at Limon Bay, a breakwater 2 kilometres (6561 feet) in length.

6. The estimate of amount of excavation is as follows: in earth, 12,005,000; hard soil, 300,000; hard rocks, 6,786,000; a total of 19,091,000 cubic metres. For above water: earth, 27,350,000; soft rock, 825,000; hard rock, 27,734,000; making a grand total of 75,000,000 cubic metres.

The estimate for excavation of rock above water is given at 2½ francs; for rocks of mean hardness, 7; for hard rocks, 12; for excavation of rock where pumping is required, 18 francs.

For dredging and excavation under water: mud, 2½ francs; hard soil, 12; excavation of rocks, 35 francs per cubic metre.

The proposed dam at Gamboa has a length of 1600 metres (5249 feet), with a height of 40 metres (131 feet), exclusive of foundation. The cost is set down in a round sum of 100,000,000 francs.

The lateral canals for the purpose of securing surface-drainage are also set down for a round sum of 75,000,000 francs, the tide-lock at Panama at 12,000,000, and the breakwater in Limon Bay at 10,000,000, which, with a contingent of 10 per cent., makes a grand total of 843,000,000 francs, which the commission states was "the cost of the work at the prices fixed by the Paris congress for the various items."

M. de Lesseps gives further information to the Board of Trade of San Francisco. Length of canal, 45 miles, with a cutting through an elevation of 90 metres (295 feet) above ocean-level for a distance of three-fifths of a mile. He estimates the time necessary for construction at

* On page 7 of Commander Lull's report will be found his instructions, and the reasons for the proposed height of lockage and objections to a sea-level canal by that route.

six years, and proposes a depth of water below the sea-level of 27 feet.

It is apparent that the capacity of the proposed reservoir, the strength of the dam, and the sufficiency of the proposed lateral canals, as well as their strength of embankment, are of the utmost importance to the security of the work.

The prevalence of calms in Panama Bay and its approaches appears on all weather-charts, and has been especially remarked by Capt. Bedford Pine, of the British navy, and also by Commander Maury, formerly of our navy, who regards this fact as making that locality totally unfit for the construction of a canal.

length varies from 32 to 81 miles; depth of cutting, 50 to 80 feet; sea-level, with two tide-locks; estimated cost, from $8,000,000 to $41,000,000, according to route.

6th. From Cape Cod Bay to Buzzard's Bay. Length, about 18 miles; proposed by a company incorporated by the State of Massachusetts; estimated cost, $4,000,000.

7th. From the Atlantic Ocean to Appalachicola Bay, across Florida (with locks). Proposed and surveyed by the U. S. government; length, 168.5 miles; summit, 203 feet; estimated cost, $50,278,746.

8th. Between Caspian and Black Seas *via* Sea

*Existing Ship-Canals.**

Name of Canal.	Where Situated.	Connecting what Waters or Localities.	By whom Designed.	Length—Miles.	Height of Summit—Feet.	Number of Locks.	Passes Vessels of Draft—Feet.	Cost—Dollars.	When Opened or to be Opened.	Remarks.
Caledonian.	Scotland.	Loch Lihnne and Inverness Frith.	Telford.	60½	100	23	17	5,000,000	1823	Hardly pays expenses.
Great North Holland.	Holland.	Amsterdam and the Helder.	Blanken.	51½	1½ to 5 feet below the sea.	3	17 to 18	7,500,000	1825	
North Sea.	Holland.	Amsterdam and North Sea.	A Dutch Commission.	14 1-5	1 7-12 below sea.	2	24	16,000,000	1876	
St. Mary's Falls.	Michigan.	Lake Superior and Lake Huron.	Canfield.	1	18	2	10	1,000,000	1855	
St. Mary's Falls.	Michigan.	Lake Superior and Lake Huron.	Poe.	1	18	1	17	Estimated 2,200,000	Probably 1880	The largest ship-canal lock in existence. Expenditures to July 1, 1880, $1,569,173.
Welland and St. Lawrence.	Canada.	Lake Erie and Tide-Water.	Canadian Commission.	70⅝†	536½	54	10	14,847,227‡	1844 to 1856	This canal system consists of seven different sections, varying in length from ¾ to 27⅛ miles.
Welland and St. Lawrence.	Canada.	Lake Erie and Tide-Water.	Canadian Commission.	69⅝	536½	53	13	38,623,948‖	Probably 1882	
Suez.	Egypt.	Mediterranean and Red Sea.	De Lesseps.	100	Sea-level.	0	26	About 100,000,000	1869	

* Includes the new St. Mary's Falls, Welland and St. Lawrence enlargement, none of which are quite completed.
† Does not include river and lake navigation.
‡ The cost of canals up to date of confederation, in 1867.
‖ Includes upwards of $8,000,000 expended in improvements and enlargement from 1867 to 1877.

Proposed Ship-Canals.—1st. From Bay of Campeachy to Gulf of Tehuantepec, in Mexico (with locks). Proposed by private capitalists; surveyed by U. S. government; length, 144 miles; summit, 650 feet; estimate of cost not given.

2d. From Caribbean Sea to Pacific Ocean, in Nicaragua (see above description).

3d. From Bay of San Blas to Bay of Panama, in U. S. of Colombia (at sea-level). Proposed by private individuals; surveyed by order of U. S. government; length, 30 to 33 miles; height of summit, unknown; estimated cost by Paris Canal Congress, $280,000,000; tunnel, 7 to 10 miles long.

4th. From Bay of Limon to Bay of Panama, in U. S. of Colombia (see text).

5th. From Chesapeake to Delaware Bays, in Maryland and Delaware. Several routes proposed; surveyed by the U. S. government;

of Azof, in Russia. Proposed by the Russian government. The summit, or divide, is stated to be but 23 feet above sea-level. The Caspian is 84 feet below the level of the sea.

9th. Between the Baltic and North Seas, in Germany (with locks). Proposed by the imperial government of Germany. Connects the mouth of the Elbe and the port of Kiel. Distance, about 45 miles; estimated cost, $18,750,000.

10th. From the Mediterranean to the North Sea, in France. Proposed by Capt. Salicis, of the French navy; length, 1071 miles; summit, 935 feet; no locks, except at the sea.

11th. From the Gulf of Finland, near Cronstadt, to St. Petersburg, in Russia (at the sea-level). Now under construction by the government. Length, 16.4 miles; designed to be extended in a reduced size to the White Sea.

12th. From the Gulf of Manaar to the Palk Strait, in India (at the sea-level). Proposed

by the government; length, about 3 miles; estimated cost, $2,200,000.

13th. From East River, New York Harbor, to the Hudson, *via* Hudson River (sea-level). To be constructed by the government. Length, about 6 miles; estimated cost by Gen. Newton, $2,100,000.—*Daniel Ammen, Rear-Admiral U.S.N.*

Can-body. An old term for a can-buoy.

Can-buoy. A buoy in the form of a cone; they are floated over sands and other obstructions in navigation as marks to be avoided. See BUOYS.

Cancer, Constellation of (Lat. *Cancer*, "The Crab"). The fourth constellation of the ancient zodiac, lying between Gemini and Leo. There is no star in it above the fourth magnitude.

CANCER, SIGN OF. The fourth division of the ecliptic, including from 90° to 120° of longitude. Owing to the precession of the equinoxes, the *constellation* Cancer is no longer in the *sign* of the name, the constellation Gemini having taken its place. The sun is in Cancer from about June 21 to about July 22. Symbol ♋.

CANCER, TROPIC OF. That parallel in the northern hemisphere whose latitude is equal to the sun's greatest declination, about 23° 28′.

Candle. Candles which are used for the battle-lanterns are kept primed. The magazine lantern is fitted to burn candles made of hard spermaceti or wax; those of paraffine, or such as have tallow in them, are prohibited, and all candles are thoroughly examined and tested. When candles are used for side lights they should be of sufficient size to burn from sunset to sunrise, and to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles.

CANDLE-BARK. A cylindrical tin for candles.

Cane. The rattan (*Calamus rudentum*) is sometimes used for standing rigging and cables. The cables remain in the water a long time without decaying or becoming injured by the teredo. They are very hard and difficult to cut, and are therefore used to connect logs as booms to stop the navigation of rivers. See CANEVAS.

Canes Venatici (Lat. "The Hunting Dogs"). A constellation between Ursa Major and Boötes. The principal star is marked 12 *Canum Venaticorum*, named also *Cor Cároli*, and may be found by drawing a line from Dubhe, the star of the Great Bear nearest the pole, to the opposite star of the square of that constellation, and producing it to nearly twice the distance.

Canevas. An old word for hemp canvas, but many races in the East make sails entirely of cane.

Can-hooks. Hooks used to sling a cask by the chimes.

Canis Major (Lat. "The Greater Dog"). A constellation to the S.E. of Orion, containing the brightest star in the heavens, *a Canis Majoris*, the Dog Star; it can be found by continuing the line of the belt of Orion to about three times its length.

Canis Minor (Lat. "The Lesser Dog"). A constellation to the E. of Orion, containing a bright star, *a Canis Minoris*, called also *Prócyon*. It can be found by continuing a line through the two upper stars of Orion to about twice its length.

Canister. A tin or sheet-iron cylinder filled with cast-iron shot, and closed at the ends by blocks of wood; the larger sizes are strengthened by a spindle running through and connecting the ends, having a nut and handle fixed to the upper part. The interstices are filled with dry sawdust to give greater solidity to the mass, and to prevent the balls from crowding when the piece is fired.

Cannon. A military engine for projecting shot, shell, etc., by the force of gunpowder. Cannons are classified as guns, howitzers, and mortars (which see). See ORDNANCE.

CANNONADE. The opening and continuance of the fire of artillery upon any object.

CANNON-PERER. An ancient piece of ordnance in ships of war for throwing stone shot.

CANNON-PETRONEL. A piece of ordnance with a 6-inch bore which carried a 24-pound shot.

CANNON-ROYAL. A 60-pounder of 8½-inch bore.

CANNON-SERPENTINE. An old name for a gun of 7 inches bore.

Canoe. A light narrow boat which is impelled by paddles used vertically, and sometimes fitted with a sail. It is formed of a tree hollowed out by hewing or burning, or of a light frame-work covered with bark or hides. Canoes are also made of iron, paper, and caoutchouc. See ROB ROY.

The Fejee Islanders use a double canoe, which is fitted with an enormous sail. The two canoes are several yards apart, but a deck extends over and is firmly secured to both. See FLYING PROA.

Canopus. The name of the star *a Argûs*.

Canopy. A light awning over the stern-sheets of a boat. The brass frame-work over a hatch.

Cant. The term used to express the position of a piece of timber which does not stand square; it is said to be on a cant or diagonal line. A cut made in a whale, to which is made fast the lower block of a purchase for turning the whale over during the operation of flensing. To turn anything so that it does not stand square. To diverge from a central line.

CANT BALLAST. When a ship by a violent lurch throws her ballast over to leeward, where it remains, keeping her from righting, she is said to *cant* or *shift* her ballast.

CANT-BLOCKS. The blocks of the cant-purchase.

CANT-BODY. That part of the plans of the body of a ship, either in the drawings or in the mold-loft, which represents the outlines of the cant-timbers, and also the lines of the bevelings of the timbers.

CANT-FALLS. See SPIKE-TACKLE.

CANT-FRAME.—The name of one of those frames of the ship which do not stand square across the keel, but which have their heads inclined in a diagonal direction, either forward or aft, as may be needed to fill the space between the square frames and the stem forward, or the square frame and the counter-timbers at the after end of the ship.

CANT-HOOK. A lever with a hook, for slueing heavy articles.

CANT-MOLDING. The molding of any one of the frames or the timbers by the use of the cant-molds and the cant-bevels, prepared in the mold-loft, preparatory to the timbers being cut into the required shape by the workmen.

CANT-PURCHASE. A purchase of which the upper block is secured to the mast-head, and the

lower block to the whale, to turn it over during the operation of flensing.

Cant-timber.—The name of any one of the timbers, of which there are several in each cant-frame.

Cantara. A watering-place.

Canteen (Fr. *cantine*). A military term which in the United States is applied only to a tin vessel covered with cloth and furnished with a strap by which it is slung, which is issued to soldiers for carrying water for their personal use on the march or in campaign. In other countries the term, or its equivalent, is used to indicate a small wooden or leathern chest or coffer containing the table equipage and utensils of an officer in campaign; it is also applied to the store of the licensed sutler of a regiment or garrison.

Cantick-quoin. A quoin used in chocking up casks to keep them from working.

Canting-livre. A light piece of ornament at the forward part of a quarter-gallery, also called *console-bracket*.

Cant-line. Gant-line or girt-line (which see).

Canton. A city of China, and the great commercial emporium of the province of Quang-Tong, on the left bank of the Canton or Pearl River, about 80 miles from its mouth in the China Sea. Lat. 23° 6′ 9″ N.; lon. 113° 15′ E. Canton, with its suburbs, occupies the north bank of the river, extending inland nearly to a row of heights commanding it on the north and northeast, but between which and the city is a broken ravine; to the south lies an alluvial plain, formed by the delta of the river. A large part of the population reside on the water, and for four or five miles opposite the city and both above and below the river is crowded with vessels and rafts of all kinds. Pop. 1,500,000.

Cant-rope. See Four-cant.

Cant-spar. A small spar fit for making a small mast, yard, boom, etc.

Canvas. Coarse cloth made of hemp, flax, or cotton. In the navy cotton canvas is used for mess-cloths, tarpaulins, boom-covers, windsails, bags, hammocks, etc. Flax canvas is used for sails, and is woven in *cloths* 24 inches in width, and put up in *bolts* of 40 yards each. Canvas is numbered from 1 to 9, No. 1 being the heaviest. In large vessels numbers 1, 2, 3 are used for storm-staysails, courses, and topsails; 4 and 5 for jib and main topgallant-sails, and the lighter canvas for royals, stun'sails, flying-jib, etc.

It is of the first importance to obtain the best canvas, as the safety of the ship frequently depends on its quality. The warp or chain of Nos. 1, 2, and 3 should be wholly wrought and made of double yarns, and both the warp and shoot or weft yarn ought to be made of long flax, which should be well dressed, properly cleansed, even spun, and well twisted; and all the weft yarns should be fully as strong as the warp yarns.

It has been found that sails made with the seams and selvages running down parallel with their edges are very apt to bag and become worn in the middle from the strain to which they are subjected by the force of the wind. To obviate this, a mode of making sails with the seams and selvages running diagonally was proposed by Admiral Brooking, and a patent was granted to him in 1828. It has also been proposed to weave the canvas with diagonal threads; that is, to place the weft yarns at an oblique angle to the warp yarns. To accomplish this object the loom must be peculiarly constructed, its warp and work-beams must stand at an oblique angle with the sides of the loom, and the batten and slay must hang in a peculiar manner, in order to beat up the weft in lines ranging diagonally with the warp.

Canvas is also a technical term for the sails of a ship. *Under canvas*, under sail; *storm-canvas*, the storm-staysails, trysails, storm-mizzen, double-reefed foresail, close-reefed fore and main topsails, and fore-topmast staysail.

Canvas-back. A species of duck, *Fuligula valisneriana*, deriving its name from the color of the plumage on its back.

Cap. A bit of leather or tarred canvas put over the ends of standing rigging to protect them from the weather. A large thick block of wood having a round and square hole in it, used to confine two masts together when one is erected at the head of the other. The square hole of the lower cap fits over the tenon of the lower mast, and the topmast traverses through the round hole. The topmast is fitted with a cap for the topgallant-mast, and the bowsprit for the jib-boom.

In mechanism, a block or plate of wood or metal, used to confine the adjustable bearings of a journal. It is usually secured by bolts and nuts, or by keys. See Journal.

Generally, a cap is a top-piece used to confine, cover, or protect any portion of a machine or structure.

Cap-block. The upper piece of each pile of building blocks on which the keel is laid.

Cap-scuttle. A scuttle having a ledge or coaming, over which is a top setting closely into a rabbet.

Cap-shore. A supporting spar between the cap and trestle-trees.

Cap-square. A curved plate of metal, so arranged as to be easily removed, used to confine the trunnions of a gun to the carriage.

Capabarre. An old term for misappropriating government stores.

Capacise. A corrupt form of *capsize*.

Capacity. Burden; tonnage; extent of room or space.

Cape. To keep a course. *How does she cape?* How does she lie her course?

Cape. A cape is a neck of land extending some distance into the sea, or into other bodies of water. A high, mountainous cape is called a promontory; a low, sandy cape is called a spit; a very small, sharp cape is called a point. The term headland, or head, may include all these, or indicates a broad cape.

The local names used to designate these headlands have, in many instances, remained on the charts. Point is the term generally used to indicate a cape on the shores of the Baltic and Gulf of Finland. In Prussia, Ort; in Norway and Sweden, Naes, Horn, and Kyn; in Denmark, Naes; in Holland, Hoek; in Scotland, the Shetland and Orkney Islands, Ness and Head; Ru in the Isle of Skye; Butt and Aird in the Hebrides; Point, Nab, Ness, and Head in England and Wales; Head and Foreland in Ireland; Spit in the Caspian and Aral Seas; Ras in North Africa, the Red Sea, Persian Gulf, and coast of Arabia; and Saki in Japan, are common examples of these designations.

In the names of the thousands of capes that fringe the continents and islands of the world, navigators have perpetuated their own names, the names of their vessels, their countries, their cities, their great men, their rulers, and their heroes, while the saints of the calendar are not to be forgotten as long as the many Cape St. Elizabeths, St. Sebastians, St. Anthonys, and many other sanctified names remain. Some headlands are named from the circumstances attending their discovery, as Cape Disappointment, Cape Flattery, and others; some from the day on which they were first seen, as Friday Cape, etc.; others from physical characteristics, as Rojo (Red Cape), Blanco (White Cape), Verd (Green Cape), Sandy Cape, Rocky Point, etc.; others again from the products of sea or shore found near them, as Cape Cod, Lobos (Seal) Point, etc. Many capes are remarkable from the important position they occupy, being prominent landmarks to the mariner, and some even receive their names from this characteristic, as Start Point; and Land's End and Finisterre describe their position by their names. Some headlands attain a prominence from being at the entrance of important bays, rivers, or harbors, where large cities and greater commerce enhance their usefulness. On the more prominent headlands of the world light-houses are placed, and those that are at the entrance of important places have electric, or other lights of a high illuminating power.

The following capes on the coast of the United States have first-order lights:

Capitana. The principal galley in an ancient fleet.

Caplin, or Capelin. A fish of the family *Clupeidæ*, very similar to a smelt, and used for bait for cod-fish on the banks of Newfoundland.

Cap'n. A colloquial abbreviation for captain.

Capon. A jeering term for red herring.

Capote. A storm-coat fitted with a hood, much worn in the Mediterranean.

Cappanus. The worm which adheres to and gnaws the bottom of a ship.

Capped. A ship endeavoring to make her way against head currents is said to be *capped.*

Capricorn, Tropic of. That parallel in the southern hemisphere whose latitude is equal to the sun's greatest declination, about 23° 28′. See Tropics.

Capricornus, Constellation of (Lat. *Capricornus*, "The Goat"). The tenth constellation of the ancient zodiac, lying between Sagittarius and Aquarius. There is no star in it above the third magnitude; α and β may be found by the line joining Lyra and Altair being produced to not quite its own length.

Capricornus, Sign of. The tenth division of the ecliptic, including from 270° to 300° of longitude. In consequence of the precession of the equinoxes, the *constellation* of Capricorn is no longer in the *sign* of this name, the constellation Sagittarius having taken its place. The sun is in Capricorn from about December 21 to about January 20. Symbol ♑.

Name.	No. of Lights.	Lat.	Lon.	Height, in Feet.	Distance Visible, in Miles.	Character and Color.
Elizabeth	2	43° 34′	70° 12′	143	18	Fix. and Fl. W.
Ann	2	42° 38′	70° 34′	165½	20	Fix. White.
Cod	1	42° 02′	70° 04′	195	20	Fix. W.
Gay Head	1	41° 21′	70° 50′	170	20	Fl. W. and R.
Montauk	1	40° 04′	71° 51′	169½	20	Fix. var. by W. Fl.
Pondquoque Point	1	40° 31′	72° 30′	160	19	Fix. W.
May	1	38° 56′	74° 58′	167	19	Fl. W.
Henlopen	1	38° 47′	75° 65′	128	17	Fix. W.
Charles	1	37° 07′	75° 54′	150	19	Fl. W.
Hatteras	1	35° 15′	75° 31′	191	20	Fl. W.
Lookout	1	34° 37′	76° 31′	156	19	Fix. W.
Romain	1	32° 01′	79° 22′	154	18	Fl. W.
Canaveral	1	28° 28′	80° 32′	139	18	Fl. W.
Point Conception	1	34° 27′	120° 28′	208	23	Fl. W.
Pigeon Point	1	37° 11′	122° 24′	150	18½	Fl. W.
Point Reyes	1	38° 10′	123° 01′	296	24	Fl. W.
Point Arena	1	38° 57′	123° 45′	156	19	Fix. W.
Cape Mendocino	1	40° 26′	123° 24′	423	28	Fl. W.
Blanco	1	42° 46′	124° 33′	256	23	Fix. W.
Foulweather	1	44° 39′	124° 04′	161	19	Fix. W.
Disappointment	1	46° 12′	124° 02′	232	21	Fix. W.
Flattery	1	48° 19′	124° 44′	162	19	Fix. W.

F. S. Bassett, Lieutenant U.S.A.

Cape Fly-away. A cloud-bank having the appearance of distant land.

Cape-hen. A bird which follows in the wake of a ship rounding the Cape. It is a small kind of albatross. See Molly-mawk.

Cape-pigeon, or Cape-petrel. A sea-bird which follows a ship round the Cape.

Capella (Lat. "The Kid"). The star α *Aurigæ*.

Caper. A vessel used for privateering by the Dutch in the 17th century.

Caper-cornerways. Diagonally.

Capful of Wind. A light puff of wind which speedily dies away.

Capsize. To upset or overturn; as, to capsize a ship.

Capstan. A machine used on shipboard when mechanical power is required for the moving or raising of heavy weights. It involves the principle of the wheel and axle, and is an improvement of the windlass, by which greater compactness and convenience in use are obtained. It also admits of the application of greater power upon the levers or bars.

The capstan has been used from the earliest times as a mechanical power. It was in use by the English, French, and Spanish as early as the 15th

century, and the drum-capstan in nearly its present form was invented by Sir Thomas Moreland in 1661. It consists of an upright cylinder, called the barrel, surmounted by a circular disk called the drum-head, the circumference of which contains sockets for the admission of the capstan-bars or levers by which the capstan is turned.

To the surface of the barrel, and forming a part of it, are attached several upright pieces of wood called whelps, which serve to increase the circumference of the barrel with but slight increase in the weight of the capstan. The outer edges of the whelps being concave, the turns of the rope or messenger *surge* or slip towards the centre of the barrel as it is wound about it by the revolutions of the capstan. The base of the capstan is called the pawl-head, and is similar in size and shape to the drum-head. The pawls are short stout pieces of iron attached at one end to the periphery of the pawl-head. The pawl-rim is a narrow circular part bolted through the deck to the partners, and is of sufficient width to admit the lower end of the pawls as the capstan is turned. By means of the pawls and the cross-pieces or notches in the pawl-rim, the capstan is prevented from turning back when the power is removed from the bars.

The axis of the capstan consists of a vertical iron spindle, attached to one or more decks, and by which the capstan is held firmly in place. The same spindle may serve as the axis of a double capstan, or two capstans on different decks, by which the power of both may be applied to the same object, or they can be detached and used separately.

Previous to the improvements that have been made in capstans, the cable was connected with the capstan by means of a rope called the messenger. Three or four turns of the messenger were placed upon the capstan, one end passed forward on one side of the deck, and returned on the opposite side, and the two ends lashed together, forming an endless rope, the bight of which extended from the capstan to the hawse-hole. The messenger was fastened to the cable by means of nippers, those nearest the capstan being changed to the cable near the hawse-hole as they approached the capstan.

Capstans composed entirely of iron are now in general use, and improvements have been made by which the chain-cable is brought directly to the capstan and the use of the messenger thereby avoided. They are so constructed that the cable passes around the rear of the capstan, and fits into a space between the barrel and pawl-head, in which are placed chain-whelps, which prevent the cable from slipping. After leaving the capstan the cable passes around a vertical friction-roller, which is placed in a socket in the deck, and thence to the chain-locker on the side of the deck to which the cable belongs.

Steam-power has also been applied to this description of capstan on board of steamers, by which means the number of the crew may be reduced.

An increase of power has also been obtained by means of a system of gearing placed inside of the capstan, which connects the barrel with the spindle. By the use of a *lock-bolt* the capstan can be used as a simple purchase, but by removing the bolt the gearing is brought into action, and the power is increased threefold. The barrel of the capstan then turns in a contrary direction to the drum-head.—*E. T. Strong, Lieutenant U.S.N.*

To pawl the capstan, to drop the pawls into their sockets to prevent the capstan from turning back. *To rig the capstan*, to ship and swift in the bars. *To surge the capstan*, to slack the rope wound around the barrel of the capstan to prevent it from riding or fouling. *To walk back the capstan*, to lift the pawls and turn the capstan in the opposite direction.

CAPSTAN-BAR. A long lever to give an increase of power in heaving at the capstan.

CAPSTAN-BARRING. A sea-punishment, in which the offender was sentenced to carry a capstan-bar during the watch.

CAPSTAN-BAR PIN. A pin sometimes inserted on the end of a capstan-bar to prevent it from unshipping.

CAPSTAN-STEP. The steady, measured tread of the men while heaving at the capstan.

Captain. A name given to the crooner, crowner, or gray gurnard (*Trigla gurnardus*).

Captain. This almost universal term of command is supposed to have originated in the naval service from "*caput*," the head or chief, and "*thane*," a Saxon title of honor, which by statute of King Athelstan was conferred on any merchant who had been thrice across the high seas upon his own account.

Post-captain was a term frequently used in the Royal navy and the U. S. navy to distinguish captains commanding frigates, from master-commandants or commanders the next in rank, commanding vessels of a smaller size, who in common conversation were and are called "captain." There never was such a commission as "post-captain" in either service.

In the British navy, in 1747, when the rank of captain was first clearly defined, those captains who commanded post-ships, or what are now called rated ships, in the Royal navy took rank, if of three years' standing, with army colonels, and until the year 1824 the Royal Navy List described them as *post-captains*. The prefix "post" then disappeared without any order in council or warrant being issued.

Until 1862 captain was the highest commissioned rank in the U. S. navy, and ranked with, according to seniority or duty, a lieutenant-colonel, colonel, or brigadier-general. Under the present organization of the U. S. navy a captain has assimilated rank with a colonel in the army.—*G. H. Preble, Rear-Admiral U.S.N.*

A captain commands a vessel of the second class, or a vessel of the first class under an admiral, vice- or rear-admiral, or a commodore; may be employed as aid to any grade of admiral; as chief of staff to a naval force or detached division, commanded by a rear-admiral or commodore; on duty under a bureau; act as second in command of shore-stations, and may command small practice or flying squadrons. See COMMANDING OFFICER.

The name is also given to certain leading men in the ship's company; as, captain of a gun, captains of tops, forecastle, afterguard, hold, etc.

Captain is also the popular title of the master of a merchant vessel.

Captain of Navy-yard. The line-officer next in rank to the commandant of the yard; he com-

mands during the temporary absence of the commandant, but has no authority to change the established routine. He has special charge of the police and the enforcement of police regulations; of all the fires and lights in the workshops, and, after working hours, he will satisfy himself that there is no danger of fire through the night; of keeping the walks and grounds clean and in good condition; of the berthing, moving, and mooring vessels, and of the fire- and other tugs. The captain of the yard directs the fire department, and he frequently examines the engines and all apparatus for subduing fires, reports at once any deficiencies, and once a month at least, in writing, their actual condition. He causes to be scrutinized all articles and packages passing into or out of the yard; all suspected articles are stopped and examined, when, if found to be of an improper character, they are detained, and a report made to the commandant. Each morning all passes presented at the gate during the preceding day are delivered to the captain of the yard for inspection and report. He has no direct authority or control of the affairs of the yard by virtue of his own rank or position, but it is his duty to convey to the heads of the departments of the yard such orders as the commandant desires to transmit verbally; and it is also his duty to visit and observe all parts of the navy-yard and its establishments, and to make such reports as will enable the commandant to be fully informed as to the harmonious working of the various parts of the station under his command. A regular journal is kept under his direction, which he is to sign daily and submit monthly to the commandant for his approval. In it must be entered the time when all officers report for duty at, or are detached from, the yard, when any vessel is received for repairs or put in commission, the number of mechanics and others employed, the arrival and departure of all vessels of war and of vessels with stores of any kind for the yard, the time when any vessel is taken into or removed from the dock, the state of the wind and weather, as well as the barometer and thermometer, and the other principal transactions of the yard.

Captain's Cloak (*Eng.*). The jocose name given to the thirty-sixth article of war: "All other crimes not capital, and for which no punishment is hereby directed to be inflicted, shall be punished according to the laws and customs in such cases used at sea."

Captive. A prisoner taken by force or stratagem in war by an enemy. Kept in bondage or confinement.

Captor. One who takes a prisoner, prize, or place in war. See INTERNATIONAL LAW, PRIZE.

Capture. The act of taking. To take a prisoner, prize, or place in war. The thing taken. See INTERNATIONAL LAW, PRIZE.

Carack, Carrak, or Carrick. A large ship of burden, the same with those called galleons. Hippus, the Tyrian, is said to have first devised caracks, and onerary vessels of prodigious bulk for traffic or offense. See CARRAC.

Caracora. A proa of Borneo, Ternate, and the Eastern Isles; also called caracol by early voyagers.

Caramoussal. A Turkish merchant ship with a pink-stern.

Caravel, or Caravela. A Portuguese dispatch-boat, lateen-rigged, formerly in use; it had square-sails only on the foremast, though dignified as a caravela.

Caravelao. A light pink-sterned vessel of the Azores.

Carbasse. See KARBATZ.

Carbin. A name for the basking shark (which see).

Carcass. A shell for incendiary purposes, filled with a very fiercely flaming composition of saltpetre, sulphur, resin, turpentine, antimony, and tallow. It has three vents for the flame, and sometimes is equipped with pistol-barrels, so fitted in its interior as to discharge their bullets at various times. The ribs, keel, stem, and stern-post of a ship after the planks are stripped off.

Carcatus (from *caricato*, It.). A law-term for a freighted ship.

Card. The dial or face of the magnetic compass,—probably derived from *cardinal*.

Cardinal (Lat. *cardinalis*, literally pertaining to a hinge, *cardo*, hence that on which other things turn, principal). The points to which, as regards position and motions, others are referred. Thus we have "the Cardinal Points of the Compass," "the Cardinal Points of the Horizon," "the Cardinal Points of the Ecliptic."

CARDINAL POINTS OF THE COMPASS. The same as the cardinal points of the horizon, but with reference to the direction of the magnetic needle. They are named *North*, *South*, *East*, and *West*; the most important of which is the North.

CARDINAL POINTS OF THE HORIZON. The four cardinal points of the horizon are the *North* (N.), *South* (S.), *East* (E.), and *West* (W.). The north and south points are where the meridian intersects the horizon, and they are the poles of the prime vertical; the east and west points are where the prime vertical intersects the horizon, and are the poles of the meridian. The north and south points are those from which the horizontal distance from the meridian of all bodies having an altitude is measured; the east point is that to which their rising, and the west point that to which their setting, is referred.

CARDINAL POINTS OF THE ECLIPTIC. The four cardinal points of the ecliptic are the two points of its intersection with the equinoctial, called the *Equinoctial Points*; and the two points where it attains its greatest distance from the equinoctial, called the *Solstitial Points*. With reference to the seasons of the northern hemisphere, these are named the *Vernal* and *Autumnal Equinoctial Points*, and the *Summer* and *Winter Solstitial Points*. These are more commonly called after the signs of the ecliptic in which they are severally situated: the *First Point of Aries* (symbol ♈) and the *First Point of Libra* (♎), the *First Point of Cancer* (♋) and the *First Point of Capricorn* (♑). The Colures intersect the ecliptic in these four points. The most important of them is the First Point of Aries, as from it right ascensions and longitudes are reckoned. The sun is in ♈ about March 21, in ♋ about June 21, in ♎ about September 21, and in ♑ about December 21.

CARDINAL WINDS. Winds from due north, south, east, or west.

Careen. A ship is said to careen when she inclines to one side, or lies over when sailing on a wind; off her keel or carina.

To careen a vessel is to heave her down preparatory to cleaning or repairing her bottom. See HEAVING DOWN.

Carey. See MOTHER CAREY'S CHICKENS.

Cargo. The merchandise with which a ship is freighted.

CARGO-JACK. A jack used on its side in stowing cargo, for forcing heavy articles into place.

CARGO-PORT. The aperture through which the cargo of a vessel is loaded and discharged. A timber-port is in the bows of the vessel.

Caricatore. Places where the traders of Sicily take in their goods, from *caricare*, to load.

Carina. An old term, from the Latin, for the keel or a ship's bottom.

Carl, or Male-hemp. See FIMBLE, or FIMBLE-HEMP.

Carle-crab. The male of the black-clawed crab, *Cancer pagurus;* also of the partan, or common crab.

Carline, or Carling. A short timber ranging fore-and-aft from one deck-beam to another.

CARLINE-KNEE. A knee in the deck-framing, which is placed against a carline.

Carn-tangle. A long and large fucus, thrown on beaches after a gale of wind in the offing.

Carous. A sort of gallery in ancient ships, which turned on a pivot. It was hoisted to a given height by tackles, and thus brought to project over, or into, the vessel of an adversary, furnishing a bridge for boarding.

Carp. A well-known fresh-water fish of the *Cyprinidæ* family, a native of Persia, considered to have been introduced into England in the time of Henry VIII.; but in Dame Berner's book on angling, published in 1486, it is described as the "daynteous fysshe" in England.

Carpenter. A warrant-officer whose duty is to see that the hull, masts, and spars of the ship are kept in good repair, and to point out any and all defects in either to his commanding officer. It is his duty also, with the men under him, to take charge of the pumps, and to stop shot-holes in time of action. *Carpenter* is also the rating of one of the mechanics belonging to the carpenter's gang.

CARPENTER'S CREW, or GANG. The mechanics of the ship not belonging to the engineer's department; as, the carpenter's mate, cooper, etc.

CARPENTER, SHIP-. A builder of ships.

Carrac, Carraca, Carrack, or Carricke. A name given by the Spaniards and Portuguese to the vessels they sent to Brazil and the East Indies; large, round built, and fitted for fight as well as burden. Their capacity lay in their depth, which was extraordinary. English vessels of size and value were sometimes also so called. See CARACK.

Carrara. The great northern diver, *Colymbus glacialis.*

Carriage. See GUN-CARRIAGE.

Carrick-bend. A peculiar bend much used for bending two hawsers together.

Carrick-bitts. The bitts which support the ends of a windlass, called also windlass-bitts.

Carronade. A gun, capable of carrying a large ball, and useful in close engagements at sea. It took its name from the large iron-foundry on the banks of the Carron, near Falkirk, in Scotland, where this sort of ordnance was first made, or the principle applied to an improved construction. Shorter and lighter than the common cannon, and having a chamber for the powder like a mortar, they were generally of large calibre, and carried on the upper works, as the poop and forecastle.

Carry. To subdue a ship by boarding; to capture a fort by an assault. To convey or propel; as, a gun *carries* well,—that is, propels the shot to a great distance. To bear or support; as, a ship *carries* canvas, guns, or cargo. *To carry on*, to conduct; as, to *carry on* duty; also to carry sail beyond the limits of prudence. *To carry away*, to break; as, to *carry away* a rope or mast. *To carry the keg*, a smuggler's phrase, meaning to continue. See LASH AND CARRY.

Cartagena. A city and seaport of the United States of Colombia, on a small sandy peninsula, connected with the continent by an artificial neck of land. Lat. 10° 25′ 36″ N.; lon. 75° 34′ W. The bay, which is landlocked and has smooth water, extends from north to south 7 miles, and affords excellent anchorage. There were two entrances to the port,—the Boca Grande, close to the town, and the Boca Chica, farther south. Two strong castles defend Boca Chica, which is the principal entrance. Pop. 9250.

Cartagena. A city and the chief naval arsenal of Spain, on a noble bay of the Mediterranean, 27 miles S.S.E. of Murcia. Lat. 37° 36′ 5″ N.; lon. 0° 56′ 36″ W. Pop. 55,000. Its harbor has been much improved by the construction of moles. An island on the south, as well as the city, is strongly fortified. In its western division are docks for building men-of-war, an arsenal, and a floating-dock. Its port communicates with the Segura River by the Lorca Canal.

Carte Blanche. Authority to act at discretion.

Cartel. In military parlance, an agreement for the exchange of prisoners. Also a challenge to fight a duel. A *cartel-ship* is one commissioned in time of war to convey prisoners for exchange, or to carry proposals of any kind between belligerent powers. She has only one gun for the purpose of firing signals, as the officer who commands her is particularly ordered to carry no cargo, ammunition, or implements of war. Cartel-ships, by trading in any way, are liable to confiscation.

Carter, John C., Commodore U.S.N. Born in Virginia. Appointed from Kentucky; sloop "Lexington," 1827; frigate "Delaware," Mediterranean Squadron, 1829–30; commissioned as lieutenant, 1837; frigate "Macedonian," West India Squadron, 1840; receiving-ship, New York, 1845; steamer "Mississippi," Home Squadron, 1846; navy-yard, Norfolk, 1847–48; frigate "Raritan," Pacific Squadron, 1852–53; rendezvous, New York, 1855; commissioned as commander, 1855; commanding steamer "Michigan," on the Lakes, 1861–64; commissioned as commodore, July 16, 1862; commanding receiving-ship "Vermont," New York, 1865; light-house inspector, 1866–69; died in 1871.

Carter, Samuel P., Commodore U.S.N. Born in Carter County, Tennessee. Appointed from Tennessee, February 14, 1840; promoted to passed midshipman, July 11, 1846; "Ohio," 74, Home Squadron, 1846–47; present at capture of Vera Cruz; commissioned as lieutenant, April 18, 1855; steam-frigate "San Jacinto," East In-

dia Squadron, 1855–57; at attack on Barrier Forts, Canton River, China, 1856; Naval Academy, 1857–60; steam-sloop "Seminole," Brazil Squadron, 1860–61; returned to the United States, July 6, 1861; July 11, 1861, Lieutenant Carter was ordered to report to the Secretary of War for special duty; was instructed to proceed to East Tennessee and raise troops; organized the Tennessee Brigade, and was assigned to command in September, 1861, with acting appointment of brigadier-general; present at Wild Cat, Kentucky, at Zollicoffer's repulse, October, 1861; at battle of Mill Springs, January, 1862; commanded in Southeastern Kentucky from February, 1862, to April, 1862; and in operations against Cumberland Gap, March and May, 1862; commissioned brigadier-general May 1, 1862; at capture of Cumberland Gap, June 17, 1862; in Kanawha Valley in October and November, 1862, at which time the rebel troops were driven out and the valley re-occupied by Union forces. Commanded cavalry expedition into East Tennessee, tore up track and destroyed bridges on East Tennessee and Virginia Railroad, and in several engagements, at Holston, Carter's Station, and Jonesville, defeated rebel troops in December, 1862, and January, 1863. This cavalry raid, which was the first of any importance made by Union troops into rebel territory, was attended with valuable results, not only from amount of damage done the rebel cause from destruction of property, loss of troops, and the breaking of their principal line of railway, but from the relief it afforded Gen. Rosecrans when pressed at Murfreesboro', and the new life it infused throughout all our cavalry commands. For this successful raid received thanks of the general-in-chief of the army in general orders; also of the commander of the Department of the Ohio, in general orders, and the commander of the district of Kentucky; was recommended by latter two for promotion to major-general; was assigned to command of division of Central Kentucky in March, 1863; at battle of Dutton's Hill, March 31, 1863; commanded in Southeastern Kentucky, headquarters at Somerset, from May to July, 1863; defeated Pegram's forces at Monticello and Beaver Dam in May and June, 1863, and Morgan at West's; was thanked, in general orders, by the commander of the Department of the Ohio. In July, 1863, was assigned to command of cavalry division, 23d Army Corps, and had the advance when Burnside occupied East Tennessee, in August and September, 1863; defeated Morgan's forces, near Emory, August 28, 1863, and Smith's, at Loudon, August 29; present at siege and battle of Knoxville, November and December, 1863; provost-marshal-general of East Tennessee, September, 1863, to January, 1865, when he was relieved at his own request, ordered to North Carolina, and assigned to command of division of the district of Newbern; commanded the left wing at battle of Kinston (Wise's Fork), N. C., on March 10, 1865, where Bragg was defeated; occupied Goldsboro', N. C., March 20, 1865, driving out the rebels with his command; was in command of the place during its occupancy by the armies of Gen. Sherman; assigned to command of 3d Division, 23d Army Corps, April 7, 1865; brevetted major-general, March 13, 1865; was in command of Western North Carolina from May, 1865, and of 23d Army Corps from July until relieved from duty in that State in August, 1865; honorably mustered out of the army January, 1866.

Commissioned as lieutenant-commander, July 16, 1862.

Commissioned as commander, June 23, 1865; commanding steamer "Monocacy," Asiatic Squadron, 1866–69; Naval Academy, as commandant of midshipmen, 1869–72.

Commissioned as captain, October 28, 1870; commanding steam-sloop "Alaska," European Station, 1872–75; member light-house board, 1876–80.

Commissioned as commodore in 1878.

Carthoun. The ancient cannon royal, carrying a 66-pound ball, with a point-blank range of 185 paces, and an extreme one of about 2000. It was 12 feet long and of 8½ inches diameter of bore.

Cartouch. A paper case containing a charge for a fire-arm. A case filled with shot to be fired from a cannon.

Cartridge. A case of paper, flannel, or sheet-metal to contain a charge of powder for a fire-arm. For muzzle-loading small-arms the powder and ball are inclosed in paper; for breech-loading small-arms the powder and ball are enveloped in a sheet-metal case, which also contains the fulminate for igniting the charge.

The cartridges for great guns, howitzers, and mortars are put up in bags made of serge cloth, woven expressly for this purpose, being entirely of wool and of a close uniform texture. It is manufactured in pieces of 29 yards in length, and from 16 to 36 inches in width. Rattinet, merino, bombazette, or silk cloth can be used if impossible to obtain the serge cartridge-cloth. Cartridge-bags are made of two shapes, conical and cylindrical, and are sewed with worsted yarn. They are white, and when filled are tied with woolen thrums, and are stenciled in black, with the calibre of gun and weight of charge. The cartridge-bags of the smooth-bore howitzers are fitted with a brass wire ring for the purpose of attaching them to the sabot of the projectile; when so attached the cartridge and projectile are called a round of fixed ammunition.

CARTRIDGE, BALL-. A cartridge for small-arms which contains a projectile.

CARTRIDGE-BOX. A small box made of harness leather, worn on the waist-belt, to contain cartridges for a pistol or rifle. See PASSING-BOX.

CARTRIDGE, BLANK. A cartridge which does not contain a projectile. It is used only for firing salutes or making signals.

CARTRIDGE, DUMMY. A block of wood of the size and shape of a ball-cartridge, for use in exercise to accustom the men to the handling of cartridges.

CARTRIDGE, METALLIC. The metallic cartridges used in the navy are central primed, and are purchased as required from private manufacturers. The same calibre is used for pistols, rifles, and machine-guns. The bullet is cylindro-conical in shape, having three rings and a concave base.

Caruel. See CARVEL.

Carved Work. The ornaments of a ship which are wrought by the carver.

Carvel. A light lateen-rigged vessel of small

burden, formerly used by the Spaniards and Portuguese. Also, a coarse sea-blubber, on which turtles are said to feed.

Carvel-built. A term to signify that the planks of a boat meet, and do not overlap as in a *clinker-built* boat.

CARVEL-JOINT. A flush joint.

Cascabel. The part of a gun abaft the base of the breech.

CASCABEL-BLOCK. The mass of iron which fits in between the jaws of the cascabel. It is removed to admit the bight of the breeching.

CASCABEL, JAWS OF THE. That part of a cascabel abaft the breeching-hole.

CASCABEL-PIN. An iron pin to secure the cascabel-block in the jaws of the cascabel.

Casco. A rubbish-lighter of the Philippine Islands.

Case. The outside planking of the ship.

Case, Augustus Ludlow, Rear-Admiral U.S.N. Born in Newburgh, N. Y., February 3, 1813. Appointed midshipman April 1, 1828; first order, July, 1828, to receiving-ship "Robert Fulton," New York; first cruise in frigate "Hudson," Brazil Squadron, 1828–31; navy-yard, New York, 1832; cruise in sloop-of-war "St. Louis," West Indies, 1832–33; New York Navy-Yard and School, 1833–34.

Promoted to passed midshipman, June 14, 1834; navy-yard, New York, 1835; schooner "Experiment," coast survey, 1836; bark "Pioneer," U. S. South Sea Surveying and Exploring Expedition, 1837.

Commissioned as "lieutenant while on duty in the exploring expedition," June, 1838; store-ship "Relief," exploring expedition, 1838; sloop-of-war "Vincennes," exploring expedition, 1839–42.

Commissioned as lieutenant, February 25, 1841; cruise in frigate "Brandywine," East Indies, 1843–45. During Mexican war: In schooner "Mahonese," brig "Porpoise," frigate "Raritan," sloops-of-war "John Adams" and "Germantown," Gulf of Mexico, 1846–48. He was present at and participated in the capture of Vera Cruz, Alvarado, and Tabasco. After the landing of the troops on the first day, was in charge of the beach and superintended the landing of men, ordnance, and stores for the investment of Vera Cruz. After possession of Laguna was taken by the "Porpoise," he was dispatched, in a "bungo" having one of the "Porpoise's" 42-pounder carronades mounted on the bow, with Passed Midshipman F. K. Murray and 25 men, up the Palisada River to the town of the same name, which was captured and held for a fortnight against a large body of cavalry which almost daily threatened an attack. The object of holding the town was to intercept and capture Gen. Santa Anna, who, it was supposed, would endeavor to escape to Honduras, *via* the Palisada passes. Cruising in sloop-of-war "Vincennes," Pacific Ocean, 1849–51; commanding sloop-of-war "Warren," Pacific Squadron, 1852–53; light-house inspector, third district, New York, 1853–57.

Commissioned as commander, September 14, 1855; waiting orders in 1858; commanding steamer "Caledonia," Brazil Squadron and Paraguay Expedition, in 1859; waiting orders in 1860. During the Rebellion: In March, 1861, just at the commencement of the Rebellion, Commander Case was ordered to Washington as assistant to (then) Commodore Stringham, in the Office of Detail; but on the assignment of the latter to the command of the North Atlantic Blockading Squadron, he was appointed fleet-captain of it, and with him joined the steam-frigate "Minnesota," at Boston, April 13. Subsequently, served in the same position with Flag-Officer L. M. Goldsborough and Acting Rear-Admiral S. P. Lee, who were successively appointed to command the fleet, 1861–62. He took part in the capture of Forts Clarke and Hatteras, August 28 and 29, 1861; Roanoke Island, February 7 and 8, 1862; Sewell's Point (where, in passing the heavy fortifications on Craney Island, he landed from his "tug" and hauled down the large rebel flag there flying) and Norfolk, May 10, 1862; and all of the general active operations of the North Atlantic Fleet, until January, 1863, when, it being understood that active operations were over, and that the duty of the fleet would be mostly confined to blockading, he was assigned to the command of the steam-sloop "Iroquois," which was fitted to look after the "Alabama," but was afterward attached to the North Atlantic Squadron. In charge of the blockade of New Inlet, N. C., 1863; cut out the steamer "Kate" from under Fort Fisher and the other batteries at New Inlet, aided by the steamers "James Adger" and "Mount Vernon," in August, 1863.

Commissioned as captain, January 2, 1863; special duty, Washington, in 1864; navy-yard, New York, 1864–65; fleet-captain, European Squadron, 1865–66.

Commissioned as commodore, December 8, 1867; light-house inspector, third district, New York, 1867–69.

Chief of Bureau of Ordnance, 1869–73.

Commissioned as rear-admiral, May 24, 1872; commanding European Squadron, 1873–75, and combined European North and South Atlantic Fleets, assembled at Key West, Fla., 1874, for special service in connection with the steamer "Virginius" difficulties, and for ordnance, torpedo, and fleet practice and tactics, etc. Total sea service, twenty-four years ten months; shore or other duty, twelve years.

Case-book. A register or journal in which the surgeon records the cases of all the sick and wounded who are placed under medical treatment.

Case-shot. See CANISTER.

CASE-SHOT, SPHERICAL. See SHRAPNEL.

Cash. A Chinese copper coin having a square hole in the centre. It bears on one side the name of the province in which it is cast and the Chinese word money; on the other side are the Chinese words "current money" and the name of the reigning emperor. It is the only native coin, and is called *tsien* by the Chinese and *sapeque* by the French.

Casing. The lining, veneering, or planking over a ship's timbers, especially for the cabin-beams; the sheathing. A bulkhead round a mast to prevent the interference of cargo, or shifting materials.

In steam enginery, a covering applied to boilers, steam pipes, cylinders, etc., to prevent radiation of heat. It is generally composed of hair felt, protected by wood or sheet metal sheathing. Asbestos cement, plaster of Paris,

and empty air-tight spaces are frequently substituted for the felt.

Cask. A strong barrel for containing fluids.

Casket. See GASKET.

Cassava, or Cassada. A species of the genus *Jatropha janipha*, well known to seamen as the cassava bread of the West Indies. Tapioca is produced from the *Jatropha manihot*. Caution is necessary in the use of these roots, as the juice is poisonous.

Cassin, Stephen, Commodore U.S.N. Born in Philadelphia, February 16, 1783; died at Georgetown, D. C., August 29, 1857. Entered the navy as midshipman, February 21, 1800; became lieutenant, February 12, 1807; master, September 11, 1814; captain, March 3, 1825. Served with distinction in the war with Tripoli; commanded the "Ticonderoga," in McDonough's victory on Lake Champlain; was rewarded by Congress with a gold medal for bravery in that action, and was a terror to the pirates who infested the West Indies, and captured four of their vessels, September 28, 29, 1822.

Cassiopeia (named after the mythical wife of Cepheus). A constellation on the opposite side of the pole to the Great Bear, and at about the same distance from it. It consists of a group of stars of the third and fourth magnitude, disposed in a form somewhat resembling a chair. *α Cassiopeia* is, of the six principal stars, the farthest from the pole.

Cast. A term meaning four; applied to herrings, haddocks, etc. The heaving of the lead into the sea to ascertain the depth of water. The act of casting anything in a mold. To force a ship's head off from the wind on getting under way. *Acast*, abox, the position of the head-yards in casting. *To cast off*, to throw off; to let go. *To cast anchor*, to come to anchor,—an expression, however, which is never used in the navy. *To cast up accounts*, to vomit,—the effect of sea-sickness. *To cast loose* a gun is to get it ready for action.

CAST-AWAY. Wrecked.

CAST-AWAYS. The people belonging to a wreck; men who are left behind when a vessel goes to sea.

CAST-OFFS. The citizen's clothing abandoned by sailors on enlisting in the navy.

Cast Knees. The hanging knees which crook or arch over the corners of the gun-ports, riders, etc.

Castle-wright. An artificer employed in the erection of castles in early ships.

Castor. α^2 *Geminorum.*

Castor and Pollux. Fiery balls sometimes seen flickering about the mast-heads and yard-arms during a gale. See ST. ELMO'S FIRE.

Casualty. That which comes without design; an event inevitable and not to be guarded against.

CASUALTIES. A word comprehending all men who die, desert, or are discharged.

Cat. A ship formed on the Norwegian model, usually employed in the coal and timber trade, and generally built remarkably strong. A cat is distinguished by a narrow stern, projecting quarters, a deep waist, and no ornamental figure on the prow. An instrument of punishment formerly used in the navy. (See CAT O' NINE TAILS.) The purchase used to hoist the anchor from the hawse-hole to the cat-head. *To cat* the anchor, to hoist it up to the cat-head and pass the ring-stopper.

CAT-BACK. A line from the cat-block to assist in hooking it to the ring of the anchor.

CAT-BEAM, or BEAK-HEAD BEAM. In former times the forward ends of the ships of war were finished square across the ship at the upper part instead of rounding to the ends as nowadays, and the cat-heads were attached to each end of this beam. The beam was generally made in two breadths, being a very wide beam, and tabled and bolted together; the forward side was placed far enough forward to receive the heads of the stanchions of the beak-head bulkhead.

CAT-BLOCK. A heavy, double, or threefold iron-bound block having a hook fitted with a link; used in catting the anchor.

CAT-HEAD. The timber that projects over the bows, and to which the anchor is hoisted.

CAT-FALL. The rope reeving through the cat-block and sheaves of the cat-head, forming the purchase called the cat.

CAT-STOPPER, or CAT-HEAD STOPPER. The ring-stopper.

CAT-TAIL. The inner end of the cat-head.

Catalan. A small Spanish fishing-boat.

Catamaran. A sort of raft used in the East Indies, Brazils, and elsewhere; those of the island of Ceylon, like those of Madras and other parts of that coast, are formed of three logs secured together by means of three spreaders and cross lashings, through small holes; the centre log is much the largest, with a curved surface at the fore-end, which tends and finishes upwards to a point. The side logs are similar in form, and fitted to the centre log. These floats are navigated with great skill by one or two men, in a kneeling position; they think nothing of passing through the surf which lashes the beach at Madras and at other parts of these coasts, when even the boats of the country could not live upon the waves; they are also propelled out to the shipping at anchor when boats of the best construction and form would be swamped. Their length is from 20 to 25 feet, breadth 2½ to 3½ feet, and the timber preferred for their construction is the *Dup* wood, or *Cherne-Maram*, the pine varnish-tree.

Catanadromi. Migratory fishes, which have their stated times of going from fresh water to salt and returning, as the salmon, etc.

Catania, a city of Sicily, on its east coast, 54 miles by rail N.N.W. of Syracuse. Lat. 37° 28′ 20″ N.; lon. 15° 5′ 15″ E. The harbor is not adequate to the importance of the city, but it is generally full of small craft. It is small, and during a strong sirocco no ship can enter. Pop. 85,000.

Catascopia. Small vessels anciently used for reconnoitring and carrying dispatches.

Cat-boat. A shallow, saucer-like boat drawing little water and fitted with a centre-board. The forward part is decked over, and the mast is stepped close to the stem. It has but one sail, which is extended by a gaff and a long boom. It can be easily handled by one person, and its management is easily learned. Its length varies from 10 to 40 feet, but the greater number are over 15 and under 25 feet in length. It is the typical American sail-boat, the cat-rig being scarcely known in Europe.

Catch. A fisherman's term for the number of fish taken at one time.

Catch a Crab. In rowing, if the oar be immersed too deep in the water the blade is carried aft and the loom thrown forward, thus jamming the oar in the rowlock; the boat's headway must be checked before it can be recovered. This mishap is termed *catching a crab.*

Catch a Turn. To belay, or take a turn quickly.

Catch-fake. An unseemly doubling in a badly coiled rope.

Catenary. The curve formed by a rope hanging freely between two points of suspension.

Caterer. A purveyor and provider of provisions. Each mess of officers selects a caterer from their number, and his duties are to preside at the mess-table and to manage and direct all the affairs of the mess; he keeps an account of the receipts and expenditures, and at the end of the month renders a statement of his accounts.

Cat-fish. The sea-cat or sea-wolf (*Anarrhicas lupus*), often six feet in length. Also a fresh-water fish of the genus *Pimelodus.* The common cat-fish is also called *bull-head* and *horned pout.*

Cat-gut. A term applied to the sea-laces, or *Fucus filum.*

Cat-harpings, or Cat-harpins. Short ropes used to bind in the rigging in the wake of the topsail-yards, that the yard may be braced sharp up.

Cathay. Marco Polo's name for India.

Cathode. Faraday's term for the negative pole of a battery.

Cat-holes. Holes through the quarter through which are passed the hawsers for fasts and springs.

Cat-lap. Tea, or weak drink.

Cat o' Nine Tails. An instrument formerly used for flogging in the navy. It consisted of nine pieces of cord, with three knots in each, fixed on a short piece of thick rope as a handle. With this the offender was flogged on the bare back. See FLOGGING.

Catraia. Portuguese surf- or pilot-boats. They are generally about 56 feet long by 15 feet beam, and are impelled by 16 oars.

Cat-rig. See CAT-BOAT.

Cat's-paw. A light air which slightly ruffles the surface of the sea. Cat's-paws occur during calms, and are transitory in their nature. Superstitious sailors scratch the booms, masts, or backstays to invoke even these cat's-paws, as they are the forerunners of a steady breeze. Cat's-paw is also a name given to a peculiar twisting hitch in the bight of a rope, making two smaller bights, into which a tackle is hooked.

Cat's-skin. The impression made by a cat's-paw on the surface of the sea.

Cattan. A Japanese sword.

Catty. A Chinese commercial weight of 18 ounces. Tea is packed in one or more *catty*-boxes; hence most likely our word *tea-caddy.*

Caudal Fin. The fin terminating the tail of a fish.

Caudicariæ. A kind of lighter used by the Romans on the Tiber.

Caul. The membrane encompassing the heads of some infants when born, and from early antiquity esteemed an omen of good fortune and a preservation against drowning. Also, a name for a dam-dike.

Caulk. See CALK.

Caury. Worm-eaten.

Cavallo, or Carvalhas. A salt-water fish, well known as the bonito, or horse-mackerel.

Cavalot. A gun carrying a ball of one pound.

Caver. A word used in the Hebrides for a gentle breeze.

Caviare. A preparation of the roe of sturgeons and other fish salted. It forms a lucrative branch of commerce in Italy and Russia.

Cavil. A large, square wooden pin fixed in a pin-rail to which are belayed the larger ropes; as, topsail-halliards, yard-ropes, etc. Sometimes the word is applied to a large cleat.

Cavity. The hollow in the water formed by the immersed bottom and sides of a vessel.

Cavo-fungo. A boat or mud-machine used by the Venetians to clean out canals.

Cawe, or Cawfe. A floating cage, in which eels, lobsters, etc., are kept.

Cawker. An old term to signify a glass of spirits taken early in the morning; an eye-opener.

Cay, or Cayos. Small insulated sandy spots or rocks. See KEY.

Cayenne. A town of South America, capital of French Guiana, on the western point of an island of the same name, at the mouth of the Cayenne or Oyaque River, in the Atlantic. Lat. 4° 56′ 5″ N.; lon. 52° 20′ W. The harbor is shallow, has two quays, and is protected by a fort and several batteries. Cayenne is a penal settlement for French political and criminal offenders. Pop. 10,500.

C. B. (*Eng.*). The uncials of Companion of the most honorable order of the Bath. This grade was at one time distributed so profusely that an undecorated veteran testily remarked that if the government went on thus there would soon be more C.B.'s than A.B.'s in the navy.

Cease Firing. The order to stop firing.

Ceiling. Strakes of plank worked between the clamps and water-ways on berth-decks, and between the thick strakes and clamps, and thick strakes and bilge-strakes in the hold.

Celestial (Lat. *cœlestis*, from *cœlum*, the heavens). Pertaining to the heavens; opposed to *terrestrial.* Thus we have the "celestial meridian," the "celestial horizon," the "celestial equator," etc.

CELESTIAL CONCAVE (Lat. *concavus*, hollow). Of the two spherical surfaces with which we are concerned, the terrestrial sphere is *convex,—i.e.*, presents its external surface to us; while the celestial sphere is *concave,—i.e.*, presents its internal surface to us. The different heavenly bodies are interspersed in space at various distances from the earth, but to an observer on its surface all of them appear to be placed or projected on the internal surface of a hollow sphere. This sphere is called the *celestial concave*, *celestial sphere*, *sphere of the heavens*, or *sphere of the stars*, its centre being the position of the observer. It must always be remembered that the celestial concave is an imaginary surface, arising in the mind of the observer either from association with the real concave surface of the retina of his eye, which is the true seat of all visible angular dimensions and angular motion, or from the inability of the eye to perceive differences of distances in objects so remote as the heavenly bodies.

CELESTIAL EMPIRE. A popular designation for China. It is said to be derived from the Chinese words *Tien Chan*, that is, Heavenly Dynasty, meaning the kingdom ruled over by the dynasty appointed by heaven.

Cell. See GALVANIC BATTERY.

Celoces, or Celetes. Light row-boats formerly used in piracy, and also for conveying dispatches.

Centaurus (*Lat.* "The Centaur"). A constellation which, together with Crux, constitutes a bright group in the southern hemisphere, pointed out by the line joining Arcturus and Spica. The two principal stars α^2 and β of the Centaur are close together, β being the nearer to the cross.

Centigrade (Lat. *centum*, a hundred; *gradus*, a step, graduation). See THERMOMETER.

Centime (*Fr.*). The hundredth part of a franc.

Central Eclipse. See ECLIPSE.

Centre. The middle part of anything.

CENTRE-FIRE CARTRIDGE. A metallic cartridge in which the fulminate occupies an axial position.

CENTRE-LINE. The line which is the exact centre of the ship, either in the drawings or upon the ship's hull.

CENTRE OF A FLEET. The division between the van and rear, or between the weather and lee divisions.

CENTRE OF ATTRACTION, or GRAVITATION. The point to which bodies tend by gravity.

CENTRE OF BUOYANCY, OF DISPLACEMENT, OF CAVITY, AND OF IMMERSION. Synonymous terms in naval architecture for the mean centre of that part of a vessel which is immersed in the water.

CENTRE OF EFFORT. A point, to which the whole force of the wind on the sails being applied, the effect produced is the same as that caused by the wind when uniformly distributed on the system of sails.

CENTRE OF GRAVITY. That point of a body about which all the parts exactly balance each other, so that if it be supported the whole body will be at rest in any position whatever.

CENTRE OF MOTION. The point about which any body, or system of bodies, moves.

Ceola. A very old term for a large ship.

Cephalopod. An animal of the sub-kingdom *Mollusca*, characterized by a distinct head surrounded by a circle of long arms or tentacles.

Cepheus. *α Cephei*, Alderanim; *β Cephei*, Alphirk. See CONSTELLATION.

Ceradene. A large fresh-water mussel.

Cercuri. Ancient ships of burden fitted with both sails and oars.

Certificate of Registry. A document which specifies the names of the vessel, master, and owners, together with the tonnage, particulars as to origin, and the port to which the vessel belongs.

Cetacea (Gr. *katos*, a whale). An order of mammals living in the sea or large rivers, and shaped like fishes for moving habitually in the watery element, having the posterior part of the spine disencumbered of a sacrum and hinder extremities to allow the tail to have a due freedom and extent of motion. They breathe air, have warm blood, and a double circulation, like the rest of the class to which they belong; they are consequently compelled to resort to the surface for the purpose of respiration; and the tail-fin is accordingly horizontal and not vertical, as in some fishes.

Cetine. An ancient float, "in bulk like a whale;" derived from *cetus*, which applied both to whale and ship.

Cetus. *α Ceti*, Menkar; *β Ceti*, Diphda. See CONSTELLATION.

C. G. (*Eng.*). Coast-guard of Great Britain (which see).

Chad. A fish like a small bream, abundant on the southwest coasts of England.

Chafe. To rub or fret the surface of cables, masts, yards, etc.

CHAFING-CHEEKS. An old name for the sheaves in the yards.

CHAFING-GEAR. Mats, strands, battens, etc., for protecting objects from injury by chafing.

Chaffer. A name for a whale or grampus.

Chain. A series of connected links. A chain-cable. A lineal measure of 4 rods, or 66 feet, divided into 100 links. When mountains, lakes, or islands are joined together so that their length greatly exceeds their breadth, they form what is termed a chain.

CHAIN-CABLE. See CABLE.

CHAIN-HOOK. An iron rod with a hook at one end and an eye for the hand in the other, used in working the chain-cables.

CHAIN-LOCKER. A locker in the hold in which the chain-cables are stowed.

CHAIN-PIPE. An aperture in the deck through which pass the chains from the locker to the deck above.

CHAIN, TOP-. A chain to sling the lower yard in action.

CHAIN-STOPPER. See STOPPER.

CHAIN-WELL. See CHAIN-LOCKER.

Chains. Iron links which secure the dead-eyes connected with the channels. See CHANNELS.

CHAIN-BOLT. The bolt which passes through the toe-links and secures the chains to the side.

CHAIN-PLATES. Iron plates to which the dead-eyes are secured; they are often substituted for chains, being considered preferable.

Chain-shot. Two balls connected by a chain for cutting the spars and rigging of an enemy's ship.

Chaland. A large flat-bottomed boat of the Loire.

Chalder. A gudgeon.

Chaldrick. A name for the sea-pie (*Hæmantopus ostralegus*).

Chaldron. A measure of coal equal to 36 bushels.

Chalink. A kind of Massoolah boat.

Challenge. The hail of a sentry to a person approaching. See DUEL.

Chamæleon. See CONSTELLATION.

Chamber. A contraction of the bore of a gun which receives the charge of powder. The chamber in general use is the conical or gomer chamber. The ballistic power of some of the European guns has been augmented by adding to the weight of the charge and igniting it in a space considerably larger than that occupied by the powder. This increased space is obtained by enlarging the chamber. If the charge had not been increased the air-space would have caused a diminution both in velocity and pressure, the latter decreasing in a greater ratio than

the former; but, by judiciously increasing the weight of the charge, it has been possible to generate a greater volume of gas behind the projectile without carrying the maximum pressure beyond that which obtained when the old cartridge and full chamber were used.

A clear space between the riders in those vessels which have floor and futtock riders.

CHAMBER-PIECE. A movable piece to fit into the breech of old guns. See GINGAL.

Chamfer. To cut or take off a sharp edge or angle.

Champlin, Stephen, Commodore U.S.N. Born at South Kingston, R. I., November 17, 1789; died at Buffalo, February 20, 1870. His father, Stephen, was a volunteer in the American Revolution. His mother, Elizabeth Perry, was an aunt of Commodore Perry. At 16 he began a sea-faring life, and at 22 commanded a ship out of Norwich. May 22, 1812, he was appointed sailing-master in the navy; lieutenant, December 9, 1814; commander, June 22, 1838; captain, August 4, 1850; and commodore on retired list, July 16, 1862. He first commanded a gunboat under Perry at Newport; was second in the command of the "Asp" in the affairs of Little York and Fort George, U. C.; and, joining Perry at Lake Erie, took command of the "Scorpion," in which he did good service at the battle of September 10, 1813, capturing the "Little Belt." Of this battle, in which he fired the first and last guns, he was the last surviving officer. In the following spring he commanded the "Tigris," and, while blockading Mackinac, was attacked at night by an overwhelming force, severely wounded, and made prisoner. In 1816 he commanded the "Porcupine," but performed little subsequent service on account of his wound. He was a resident of Buffalo from 1834.

Chancery, In. See IRONS, IN.

Chancy. Doubtful.

Chandler, Ship-. A dealer in naval stores.

Change. The voluntary substitution of a different voyage for a merchant ship from the one originally specified or agreed upon,—an act which discharges the insurers.

Changey-for-Changey. An expression used in relation to a "swap," to denote that each party is satisfied with his bargain.

Channel. An arm of the sea separating an island from the mainland, or two islands from each other. The fair-way or deepest part of a river, harbor, or strait.

CHANNEL-GROPERS (*Eng.*). Men-of-war which cruise in the English Channel.

Channels. Flat ledges of white-oak plank projecting outboard from the ship's side for spreading the lower shrouds and giving additional support to the masts; also called *chains.*

CHANNEL-BOLTS. The bolts driven through the channels edgewise, and through the frame and planking, to secure them to the ship's side.

CHANNEL-PUMP. A pump rigged in the channels.

Chape. The top locket of the scabbard of a sword.

Chapel. In a light breeze when the ship comes to against the helm, or is taken aback by a shift of wind, or by negligence at the helm, she may be recovered on the same tack without bracing the head-yards, by causing the ship to make a complete circle, until she arrives at her original position. This manœuvre is called *chapeling ship*, or *building a chapel.*

Chaph. *β Cassiopeiæ.*

Chaplain. See NAVAL CHAPLAIN.

Chapman. A small trader; a ship's supercargo.

Char. A species of trout.

Charcoal. A form of carbon obtained by burning wood with the imperfect access of air, or by heating or distilling it in iron cylinders so constructed as to allow of the collection of the volatile products, among which are *tar* and *pyroligneous acid*, which is impure vinegar. The purity of the carbon varies directly with the temperature at which the wood is charred; thus, charcoal charred at 480° contains 65 per cent. of carbon, while that charred at 750° contains 80, and that charred at 2730° contains 96; but the loss of charcoal occasioned by these high temperatures is very great, the three percentages of charcoal corresponding to these temperatures being 50, 20, and 15. Among the many uses of charcoal, that of most interest to military and naval men is its employment in the manufacture of gunpowder (which see). For this purpose the charcoal from willows and alder is now chiefly used. A peculiar kind of charcoal, termed from its color *charbon rouge*, is prepared in France for the manufacture of the gunpowder used for sporting purposes, by subjecting wood in iron cylinders to the action of superheated steam under a pressure of two atmospheres. Powder made with this charcoal absorbs moisture more rapidly than ordinary gunpowder.

Charge. The quantity of powder used in loading a fire-arm or in filling a shell or torpedo. *Service* charges are the ordinary charges authorized by the bureau of ordnance. *Battering* charges are larger than the service charges, and are used for a limited number of fires against ironclads or masonry at short range. A *bursting* charge is the full charge of powder used in a shell; a *blowing* charge is a small quantity of powder used in a shell in target practice when the object is to test the fuse.

Charge and Specification. The formal written statement of the offense alleged to have been committed by the accused before a general court-martial.

In the British service there is no distinction between the "charge," as such, and the "specification;" the fact, or body of facts, constituting each offense being only presented in a single sentence or paragraph, the separate paragraphs being numbered where the charges are more than one, but—even when the offenses are all of the same class and character—introduced by no general title or descriptive heading. In our service, on the contrary, a military charge consists of two parts,—the technical "charge" and the "specification." The former defines and designates the offense, and the latter sets forth a certain state of facts which are supposed to make out such offense. See COURT-MARTIAL.

Chargé d'Affaires. The designation of diplomatic agents of the third class.

Charity Sloops (*Eng.*). Certain ten-gun brigs built toward the close of Napoleon's wars. They were rated sloops in order to give a command to a great number of commanders.

Charles's Wain. The seven principal stars in Ursa Major, generally known as the "Dipper."

Charleston. A port of entry and the largest city of South Carolina, situated at the confluence of the Ashley and Cooper Rivers, which unite immediately below the town and form a good and spacious harbor, communicating with the ocean at Sullivan's Island, 7 miles below. It is 118 miles N.E. of Savannah, 580 miles S.W. of Baltimore, and 540 miles from Washington. Lat. 32° 46′ N.; lon. 79° 57′ W. Cooper and Ashley Rivers are from 30 to 40 feet deep, the former 1400 and the latter 2100 yards wide. The ground on which the city is built is elevated 8 or 9 feet above the level of the harbor at high tide, which rises about 6 feet, flowing by the city with a strong current, thus contributing to its salubrity. It has a water front of 9 miles. A sandbar extends across the mouth of the harbor, affording, however, two entrances, of which the deepest, near Sullivan's Island, has 18 feet of water at low tide. The harbor is defended by Castle Pinckney and Fort Sumter, each on an island, the former 2 and the latter 6 miles below the city, and also by Fort Moultrie, on Sullivan's Island. Charleston is the most commercial city of South Carolina, and has an advantageous position for trade, having a harbor deep enough for the largest ships. Pop. 60,000.

Charley Noble. The popular name for the galley-funnel.

Chart. Chart is derived from the Greek *chartēs;* Latin, *charta*, which was originally applied to a sort of paper made of the plant papyrus or biblus.

In navigation it is defined as a representation, *in plano*, of a part or of the whole of the water on the surface of the globe and the adjacent coasts.

To trace the history of cartography, an art probably as ancient as the invention of letters, would exceed the limits of this article. The period from Anaximander to Henry the Navigator, extending over two thousand years, belongs rather to the province of the antiquary.

Unquestionably the ancients had sea-maps which guided their barks in voyages of adventure or profit, and did we possess fuller sources of information much that is interesting might be said of them. But of such knowledge a celebrated historian has remarked, "We possess only what has drifted ashore from a stranded vessel."

Charts, therefore, as we understand them, may be assigned to the epoch of the inauguration of maritime enterprise among the nations of modern times. To Prince Henry, Duke of Visco, son of John I., King of Portugal, is ascribed the credit of first introducing them into the marine, about the year 1400. These were of the kind denominated plane charts, and they have continued in use to the present day, being now employed only for very limited areas.

The first chart made in England appeared in an almanac printed on vellum in 1520.

In 1542, John Rotz, a Frenchman, made for King Henry VIII. "A Book of Hydrography," containing charts of the sea-coast finely painted on large skins of parchment, still preserved in the British Museum.

For any considerable extent of surface charts of this construction were soon found to be incorrect, and their errors were successively exposed by Martin Cortes, Petrus Nonius, and Edward Wright; especially the last named, in his treatise entitled "Certain Errors in Navigation Detected and Corrected," published at London in 1599.

With a view to correcting these errors, Gerard Kauffman, more familiarly known by the Latin equivalent *Mercator* (merchant), a Flemish geographer, in the year 1556, published a chart in which the parallelism of the meridians was compensated for by increasing the length of each degree of latitude from the equator towards the poles. It, however, appears that his charts had no claim to accuracy; for the intervals between the parallels did not agree with the differences of the corresponding meridional parts of those parallels. It seems evident, therefore, that Mercator had no correct method of dividing the enlarged meridian.

The discovery of a rule for this purpose was made by Wright and published in his book above mentioned. He states that the idea was suggested to him by Mercator's chart, "But the way how this should be done I learned neither from Mercator nor any man else."

The primitive idea of the projection upon which all our modern charts for navigating purposes are constructed, expressed in the quaint language of its author, is as follows:*

"Suppose a sphærical superficies, with meridians, parallels, rumbes, and the whole hydrographicall description drawn thereupon, to be inscribed into a concave cylinder, their axes agreeing in one. Let the sphærical superficies swell like a bladder (whiles it is in blowing) æqually alwayes in every part thereof (that is, as much in longitude as in latitude) till it apply, and joyn itself (round about, and all alongst till towards either pole) unto the concave superficies of the cylinder; each parallel upon the sphærical superficies increasing successively from the æquinoctial towards either pole, until it come to be of æqual diameter with the cylinder, and consequently the meridians still widening themselves, till they come to be so far distant everywhere each from the other as they are at the æquinoctial. Thus it may be most easily understood how a sphærical superficies may (by extension) be made cylindrical, and consequently a plain parallelogram superficies; because the cylinder is nothing else but a plain parallelogram wound about two æqual equidistant circles. . . . Since in this projection the parallels are all made æqual to the equator, it is evident they are enlarged in the proportion of the radius to the co-sines of their respective latitudes; wherefore the meridian, in order to preserve everywhere its proportion to the several parallels thus increased, must, at the latitude of each parallel, be enlarged in the proportion of the radius to the co-sine of the latitude, or so that the length of a minute of the true or proper meridian, which upon the globe is the same in all latitudes, and æqual to a minute of the equator, may be to the length of a minute on the enlarged in any latitude, as the co-sine of the latitude to radius, or, which is the same, as radius is to the secant of the latitude. . . . Hence a table of natural secants to every degree and minute of the quadrant, and whose radius is 1, will express the several lengths of the enlarged meridian at the latitude belonging to those secants respectively. And hence the

* Properly speaking, this should be called Mercator's development; it is not a projection in the strict sense of the term.

sum of the secants of all the minutes from the beginning of the quadrant to the degree and minute of any parallel's latitude will be, in minutes of the equator, or nautical miles, the length of that part of the enlarged meridian which is contained between the equator and the given parallel."

In this manner Wright constructed his "Table of Latitudes for Graduating a Meridian in the General Sea-Chart," which has since obtained the name of "A Table of Meridional Parts," called by the French "*Latitudes Croissantes.*"

The above method of dividing the meridian is not geometrically accurate. Wright understood this, and devised "A conceit for dividing the meridian of the nautical planisphære that may satisfie the curious exactness of the geometrician." Since his time various mathematicians have improved on his method. The first correct solution of the problem appears in "Norwood's Epitome of Navigation," 1645. Its author is unknown, and the demonstration was not given; this was supplied by Mr. James Gregory, of Aberdeen, 1668, and more concisely at a later period by Dr. Halley.

In most works on navigation containing tables of meridional parts the calculations have been made on the supposition that the earth is a sphere, and this answers well enough for practical purposes. But theory, confirmed by observation, has shown our globe to be an oblate spheroid, and Sir Isaac Newton and others have calculated the ratio of the equatorial to the polar diameter; this is called the compression of the terrestrial spheroid. Its value has been variously estimated: that adopted by the Bureau of Navigation, is, $c = \frac{1}{299.1528}$.

On the Mercator chart the loxodrome, or ship's track, is developed as a right line making the same angle with each meridian crossed, and this constitutes its chief advantage over other systems for purposes of navigation. As for every increase of latitude a new scale of measurement is introduced, objects near the pole are increased in size but their outlines are not distorted. The relative positions of places with respect to a rhumb-line are correct, but the relative distances between places are not shown with precision.

Observed bearings, unless due north or south, or east and west at the equator, are never identical with bearings taken from the Mercator chart, and the error increases the higher the latitude. Such bearings being similar to courses on a great circle, it follows that this chart is not adapted for great circle sailing.

Since bearings obtained either by means of the magnetic needle or astronomical observations cannot be laid off with accuracy, it is evident that the Mercator projection does not answer for the more refined purposes of surveying.

All attempts to project a spherical surface on a plane result in more or less distortion of the country delineated, in large extents so great as to destroy the true proportion between the parts.

For map-making and plotting the data of a survey various projections are employed, such as the orthographic, stereographic, equidistant, conical, gnomonic, and polyconic; the last three are the only ones adapted to our present purpose. Since surveys are first plotted on one of these projections and then transferred to the Mercator chart for the use of the navigator, a brief consideration of them is not out of place here.

The conical projection is much used by European map-makers, and is drawn as if projected from the centre of the earth on the surface of a cone cutting the surface of the earth in the parallels of latitude equidistant from the extremes and middle of the required limits. Within moderate areas the distortion is quite inappreciable, and even for a considerable extent of country it is but trifling; on this account it, or some modification of it, is now generally used for maps. For purposes of accurate measurement it has the disadvantage that, with the exception of the meridians, all great circles are represented on it by curved lines. Now, all measurements between places on the earth's surface are necessarily made on the arc of a great circle, and for these to be accurately represented on paper it is of the greatest importance that the projection of every arc of a great circle should be a right line. This requirement prevents the use of the orthographic projection, which near its centre is the most accurate of all, and the same objection applies to the Mercator.

The gnomonic projection fulfills this requirement. It is formed by lines drawn through the several points from the centre of a sphere to a plane touching the sphere in a point near the middle of the country to be represented. The distortion is greater than in the orthographic or conical projections, but within the limits of a survey, so trifling as to be practically inappreciable. At a distance of 60 miles from the central point a mile so projected is but one foot too long, and no one chart on a moderately large scale exceeds 120 miles.

For detailed charts, such as are drawn by surveyors in the progress of a survey, the gnomonic projection is, practically speaking, accurate; and possessing the desired property of representing all great circles by straight lines, cutting each other at angles which within the required limits have no sensible difference from the angles at which the circles cut each other, it, or some modification of it, is much used by surveyors. The numerical computations necessary for this projection require a knowledge of conic sections; but such calculations are obviated by the use of Carrington's tables. Large charts of the gnomonic projection have been constructed for purposes of great circle sailing. Such charts are useful auxiliaries to rhumb sailing.

These two projections are used by the Admiralty surveyors and map-makers of Great Britain.

The United States Coast Survey and Hydrographic Office have adopted the polyconic system in the plotting of surveys. The coast charts of the United States are issued in this projection, and the largest extends from Cape Hatteras to Cape Sable. This is a modification of the conical projection, and supposes each parallel of latitude to be developed upon its own cone, the vertex of which is on the axis of the sphere at its intersection with the tangent to the meridian at the parallel. The "Projection Tables," published by the Bureau of Navigation, give a description of the theory and practical construction of this projection.

The survey is plotted on shipboard, as made from day to day, on blank projection sheets of

well-stretched drawing-paper. This work, together with all the data of the survey, is sent to the Hydrographic Office, where it is carefully revised; the several sheets combined form a polyconic chart on a large scale. The work is then ready for transfer to the Mercator chart.

The scale having been determined on, a Mercator chart is developed within the required limits in the following manner:

A sheet of Whatman's cold-pressed drawing-paper, previously stretched, is secured to the board by means of thumb-tacks; the usual instruments of the draughtsman should be within reach.

If the equator is to be included within the limits of the proposed chart, the values to be laid off for latitude are given directly in the table. Should the equator not come within the chart, then the difference of the meridional parts corresponding to the upper and lower latitudes gives these values. Such quantities may be directly measured off by means of a diagonal scale, or reduced to the proper proportions from a scale of yards, metres, etc. If, for instance, it be required to construct a chart on a scale of one-quarter of an inch to five minutes of arc on the equator, a diagonal scale may first be constructed, on which ten meridional parts, or ten minutes of arc on the equator, have a length of half an inch. Then, in the usual manner, multiples of one meridional part may be measured on the base-line, multiples of 0.1 on the lines parallel to the base-line, and multiples of 0.01 may be estimated between the parallels. If an inch scale be used, the meridional parts, before being laid down on the projection, must be multiplied by 0.05 or divided by 20, since 20 minutes of arc on the equator, or 20 meridional parts, have to be made equal to one inch.

Often it may be desirable to adapt the scale to a certain size of paper. In this case the extreme parallels are first drawn on the sheet, the distance between them measured, and the included number of meridional parts ascertained. Dividing the measured distance by this number gives the length of one meridional part, this represents the scale of the chart, and by it all the meridional parts taken from the table must be multiplied.

The practical construction is best shown by an example: Suppose a projection be required for a chart of 14° extent in longitude, between the parallels of latitude 20° 30′ and 30° 25′, and let the space available on the paper between these parallels measure 10 inches.

Entering the column headed 20° in the table of meridional parts and running down to the line of 30′ in the side column, will be found 1249.08; then entering the column headed 30° and running down to the line of 25′, will be found 1905.68. The difference, $1905.68 - 1249.08 = 656.60$, is the value of the meridional arc between those latitudes, for which 1′ of arc on the equator is taken as the unit.

On the intended projection, therefore, 1′ of arc of longitude will measure $\frac{10 \text{ in.}}{656.60} = 0.0152$ inches, which will be the scale of the chart; for the sake of brevity call this 0.015. By this quantity all the values derived from the table must be multiplied before laying them down on the projection, if they are to be measured by a diagonal scale of one inch. This should not be confounded with the *natural* scale, which is the proportion that the chart bears to the earth, obtained by reducing the number of feet in the minute of latitude to inches and dividing the product by the scale.

Draw now in the centre of the sheet a vertical straight line, and assume it to be the middle meridian of the chart. Construct very carefully on this line a perpendicular near the lower border of the sheet, and assume this perpendicular to be the parallel of latitude 20° 30′; it may also serve as the southern inner neat line of the chart. From the intersection of the vertical and horizontal lines thus drawn, lay off on the latter, each side of the middle meridian, seven degrees of longitude, equal to $0.015 \times 60 \times 7 = 6.3$ inches, and through the extremes draw parallels to the middle meridian, which will be the eastern and western inner neat lines of the chart. Find in the table the meridional parts for 21° 0′, which are 1280.97; subtracting from this number the parts corresponding to 20° 30′, and multiplying the difference by 0.015, we obtain 0.478 inches, which is to be laid off from the parallel of 20° 30′ on the verticals, and draw a straight line through the points thus established. Proceed in the same manner to lay off all the parallels corresponding to full degrees of latitude.

A degree of longitude will measure on this chart $0.015 \times 60 = 0.9$ inches; lay off on the extreme and middle parallels on each side of the middle meridian the distances 0.9 inches, 1.8 inches, 2.7 inches, etc., determining the points where meridians of full degrees cross the parallels on the chart, through them draw the meridians. Draw the outer neat lines of the chart and extend to them the parallels and meridians. Between the neat lines subdivide the degrees of latitude and longitude as minutely as the scale will allow. Subdivisions of longitude are found by dividing the degrees into equal parts, those for latitude being determined from the table, as explained for the full degree. Lastly, draw the border-lines and a compass, graduated into points and quarter-points, from the magnetic meridian.

The subdivisions between the parallels will serve for estimating distances. Distances between places bearing north and south of each other may be referred to the subdivisions between their parallels. Distances represented by lines at an angle to the meridians may be measured by taking a number of subdivisions near the middle latitude of the line to be measured in the dividers and applying them to that line.

A chart may be transferred from any projection to the Mercator by drawing a system of corresponding horizontal and vertical lines on both charts, forming minute squares, and the outlines and characters contained in each square of the one may be copied in the corresponding squares of the other.

The best trained eye and hand, aided by the most carefully constructed instruments, cannot render a chart perfect; but this fact is no excuse for careless, hasty execution.

The chart should be such that every portion of a sea-coast may be recognized without hesitation, and the best manner of approaching or avoiding it perceived and ports entered without the aid of a pilot in every state of weather, wind, and tide.

Besides the outline of the shore, with soundings

and off-lying dangers and relative positions of the principal points, its character should be accurately delineated. The extent of shoals, with the limits of the intervening channels, should be clearly shown and the sea-marks indicated, the directions expressed so tersely and simply that by the rapid opening or closing of the marks, and the sequence of the soundings, the mariner may be able to feel his way with decision and promptitude.

The topographic portion of such a chart should be complete, containing all the principal features which are conspicuous from the offing and the relative positions of secondary objects. The table of signs and abbreviations employed at the United States Hydrographic Office gives the necessary information respecting hydrographical representations.

For the purposes of the navigator the elaborate systems of orographic representation are not necessary, and it is needless to discuss here the relative merits of the methods of Lehman, Dufour, and others.

A judicious arrangement of light and shade, produced by increasing or diminishing the thickness of the *hachures* and inclining them so as to give the general idea of the course taken by a drop of water, supposing it to flow from the summit to the foot of a declivity, gives a plastic effect and satisfies the eye.

The title and other lettering on a chart should be executed in the plainest and neatest manner. Roman capitals are used for the principal titles, and other printing may be done in small Roman, Italics, and stump-writing.

The grand division of sea or land to which the chart belongs should be stated, also the date of survey, and by whom made; references to special plans that may be included within the limits; the longitude and prime meridian, or secondary, upon which the longitude depends; the latitude; the variation of the compass and its amount of annual change; the plane of reference to which soundings are reduced, and whether soundings are expressed in feet or fathoms; rise of spring-tides at full and change of the moon, and curves of equal variation.

Views of certain harbors and conspicuous objects are often drawn on the margins in Indian ink; in which case the bearings from the point of view should be given.

The work of the draughtsman being complete, the chart passes into the hands of the engraver, and is transferred to the copper plate; many months of careful labor must elapse before it is ready for printing and issue.

Another method of reproducing charts has, from its economy and facility, been much used by the United States Hydrographic Office, and the camera has been utilized for this purpose. By photo-lithography a chart may be reproduced; but this system lacks the clearness and accuracy of engraving, and it is not adapted to large extents. In preparing plans for this process particular care is required in making with clearness all the details, and the scale should be somewhat larger than that intended for issue.

Charts may be classed, according to their uses, under the following heads: Ocean, general, and coast charts, harbor plans, and physical charts. Various other charts are employed for scientific purposes, such as:

Chart, Variation, a Mercator chart upon which are laid down curves representing the variation of the compass at those places through which they pass. Such a chart was first constructed by Dr. Halley, in 1700, with a view to finding the longitude.

Chart of the Inclination, or *Dip of the Magnetic Needle*, containing curves expressing the amount of inclination, or dip of the needle, at the places through which they pass. The first chart of this kind appeared in England in 1721, and was published by Mr. Whiston in his treatise entitled "The Longitude and Latitude found by the Inclinatory or Dipping Needle."

Chart, Skeleton, or *Track*, blank sheets constructed on the Mercator projection for different latitudes, upon which the ship's track is to be plotted by the navigator during a cruise.

Chart, Physical, showing the streams, currents, and drifts of the ocean, prevailing winds, and meteorological data compiled from the records of navigators, made during voyages at all seasons of the year in all parts of the world.

Chart, Chorographic, a delineation of a particular country.

Chart, Heliographic, a representation of the body of the sun and of the *maculæ*, or spots, thereon.

Chart, Selenographic, a representation of the moon and the spots on her disk.

Chart, Telegraphic, a delineation of the telegraph on paper.

Chart, Topographic, a minute and scientific delineation of a tract of country. In a military sense it may have particular reference to fortifications, camps, and the movement of troops.

The charts published by the British Admiralty number over 2600, and are sold at prices varying from 6*d.* to 3*s.* each; this is below their actual cost.

In the financial year 1860–61 a sum of £11,000 was provided for this branch irrespective of the surveying, which required a larger sum. The sale of these charts in five years numbered 290,000 copies, besides the supply furnished the queen's ships.

There are 866 charts published by the United States Hydrographic Office, and, with a view to encourage their general use, they are sold below the cost price. There are over 700 charts published by the United States Coast Survey Office. —*George P. Colvocoresses, Lieutenant U. S. Navy.*

Charter. To charter a vessel is to take her to freight under a charter-party (which see).

Chartered Ship. One let to hire to one or more exclusively, or to a company. A *general* ship is one loaded with the goods of persons not connected in interest.

Charterer. The individuals, government, or company, hiring or chartering a ship.

Charter-party. A contract of affreightment in writing, by which the owner of a ship lets the whole or a part of her to a merchant for the conveyance of goods on a particular voyage, in consideration of the payment of freight. All contracts under seal were anciently called charters; they were divided into two parts, of which each party interested took one, and this was the meaning of the *charta-partita.* It was a deed or writing divided, consisting of two parts, like an indenture at common law. Lord Mansfield observed that the charter-party was an old informal

instrument, and by the introduction of different clauses at different times, it was inaccurate and sometimes contradictory. But this defect has been supplied by giving it, as mercantile contracts usually receive, a liberal construction in furtherance of the real intention and the usage of trade. The charter-party describes the parties, the ship, and the voyage, and contains, on the part of the owner, a stipulation as to seaworthiness and as to the promptitude with which the vessel shall receive the cargo and perform the voyage; and the exception of such perils of the sea for which the master and ship-owners do not mean to be responsible. On the part of the freighter, it contains a stipulation to load and unload within a given time, with an allowance of so many lay, or running days for loading and unloading the cargo, and the rate and time of payment of the freight, and rate of demurrage beyond the allotted days.

Chase. That part of a gun between the reinforce and the swell of the muzzle. A ship which is being pursued by an enemy. When a ship is so built as to be able to fire several guns right ahead or right aft, she is said to have *a good chase*. *To chase* or *to give chase*, to pursue a vessel. When the pursuer follows directly in the wake of the chase, it is *a stern chase*, which is said to be *long but sure;* each ship must depend entirely upon its speed, as there is little opportunity for manœuvring and a shift of wind would affect them equally; if the chaser have the superiority in speed there is little doubt but that the chase will be eventually captured.

To chase in the wind's eye, to chase to windward. The chaser should persevere even though inferior in speed, as an accident, a shift of wind, or a lucky shot may give her an advantage; on the other hand the chase should do her utmost to evade the pursuer, and to retard the time of being overtaken; as a fog, squall, shift of wind, darkness, or an accident to the chaser may enable the chase to escape.

CHASE-GUNS. See CHASER, BOW (or STERN).

CHASE-PORT. A port forward or aft, used for a chase-gun.

CHASER. A vessel pursuing another.

CHASER, BOW (or STERN). A gun so mounted as to fire nearly or directly ahead (or astern).

Chasse Marée (*Fr.*). A French coasting vessel, generally lugger-rigged.

Chat. A lazy fellow. A louse. A ship built on the Norwegian model. See CAT.

Chatham, Chest of (*Eng.*). An ancient institution, restored by Queen Elizabeth in 1590, for the wounded seamen of the Royal navy. It was supported by a tax on each man in the navy, according to amount of his pay. This tax was called smart-money.

Chauncey, John S., Commodore U.S.N. Born in New York. Appointed from New York, January 1, 1812.

Promoted to passed midshipman, 1821; sloop "Peacock," West India Squadron, 1822; in August, 1822, engaged in the capture of seven piratical schooners off Bahia Honda, Cuba, and a heavily-armed pirate-schooner by the boats of the "Peacock"; was ordered to command one of the prizes; the vessel was nearly decimated by yellow fever,—thirty to forty deaths among the crew, and three or four lieutenants, himself the only midshipman remaining on duty; ordered to schooner "Grampus," West India Squadron, as acting lieutenant, by Commodore Porter, 1823; ordered to sloop "Ontario," as lieutenant, 1824; Mediterranean Squadron, 1824–26.

Commissioned as commander, September 8, 1841; commanding sloop "Vandalia," West Indies, Home Squadron, 1843–45; inspector of ordnance, Washington, 1847–50.

Commissioned as captain, September 14, 1855; commanding steam-sloop "Susquehanna," 1861; engaged at Forts Hatteras and Clark, as second in command, August 29 and 30, 1861; in command of the blockade of sounds of Virginia and North Carolina, September, 1861.

Commissioned as commodore, July 16, 1862; inspector of ordnance, Reading, Pa., 1863; special service, court-martial duty, 1864–65; special service, navy-yard, New York, 1866–67; retired 1868; died 1874.

Chaw. To chew. A quid of tobacco.

CHAW-MOUTH. An opprobrious epithet.

Cheat the Devil. One is said to *cheat the devil* when, instead of being profane, he makes use of such expressions as *darn it*, *deuce take it*, etc.

Cheat the Glass. See FLOG THE GLASS.

Chebacco-boat. A boat employed in the Newfoundland fisheries.

Chebec. See CHEBACCO-BOAT.

Check. *To check* a brace, bowline, etc., is to ease it off. *To check* the headway is to lessen the ship's progress through the water. *To check* a cable is to stop it from running out rapidly.

Checkered Sides. Sides of a ship painted to show all the ports; particularly applicable when there are two or more rows.

Checking-line. A small line bent to the eye of the topgallant or royal lift and brace, and rove through a bull's-eye at the mast-head, to haul the lifts and braces in when the light yards are sent down.

Cheek. Impudent assurance. The side of a gun-carriage. The side of a block. Generally, in any machine where there are two flat timbers or parts which are similar to each other, each timber is called a *cheek*.

CHEEK-BLOCK. A block bolted to a mast or gaff, and having only one cheek, the mast or gaff forming the other side of the block.

CHEEK-KNEES. Knees worked above and below the hawse-pipes in the angle of the bow and cut-water, the brackets being a continuation of them to the billet or figure-head.

Cheeks. An old sobriquet for a marine, derived from a rough pun on his uniform in olden days.

Cheer. To animate; to encourage. To salute a person or ship by huzzaing. *To cheer ship* is to send the men in the rigging and salute a passing ship by cheering. It is forbidden by the regulations to give cheers to any officer on joining a ship, while attached to her, or on being detached from her. *What cheer?* How fare ye?

CHEERILY. Heartily; with a will.

Cheese. A circular wad covered with canvas.

Chelynge. An old name for the cod-fish.

Cherbourg. A fortified seaport town and important naval station of France, department of Manche, on the English Channel, at the north end of the peninsula of Cotentin, about 85 miles west of Havre. Lat. 49° 40′ N.; lon. 1° 35′ W. Pop. 38,000. The principal buildings are the

military and naval arsenals, hospitals, and barracks. The commercial and naval ports are quite distinct from each other. The commercial port consists of a harbor and a basin, 1338 feet long and 416 feet wide. The basin communicates with the harbor by dock-gates, which prevent the reflux of the water. The channel from the harbor to the sea is 1968 feet long and 164 feet wide, lined by a granite quay with parapets. In this channel the depth of water is never less than 19½ feet. The *Port Militaire* and *Arsenal de la Marine* consist of a port 984 feet long and 754 feet wide, capable of containing 50 large ships of war, and accessible at all times of tide for vessels of the largest class; a floating-basin closed by lock-gates, and a third basin. There are four slips for vessels of the largest size; adjoining these slips is a dry-dock. The great work, however, for which Cherbourg is noted is the *digue*, or breakwater, stretching across the roadstead. The *digue* was commenced by Louis XVI., and finished in 1858. It is 2¼ miles from the harbor, in water varying from 40 to 65 feet deep. Its proportions are—length, 4120 yards; breadth at base, 262 feet; at top, 102 feet. The entrance east of the *digue* is 3285 feet wide, and that to the west 9875 feet. A fort and light-house occupy the centre of the *digue*, and there are also light-houses at each entrance to the roadstead, and one at the entrance to the commercial port. The defenses consist of the batteries of Fort National, of 100 guns, on the Isle of Pelée, and many other forts, which render Cherbourg, if not impregnable from the sea, at least very difficult of attack.

Cheremeri. In the East, a bribe in making a contract or bargain.

Cherry. A species of smelt or spirling in the Frith of Tay.

Chesil. A term used for a bank of shingle.

Chess-trees. Formerly, certain pieces of oak timber, fayed and bolted to the topsides, one on each side, abaft the fore-channels, which had a sheave fitted in the upper part, for the convenience of hauling home the main tack.

Chest. A box of wood in which articles are deposited; as, an arm-chest, a top-chest, etc. A *sea-chest* is generally capable of being taken apart and stowed in a small space.

Chester (Pa.), on the Delaware River, 15 miles below Philadelphia. The celebrated ship-yards of John Roach, which give employment to 2500 men, are situated here. Pop. 15,000.

Chest-rope. Guess-rope, or guess-warp.

Chevender. An old name for the chevin or chub.

Chevil. See Cavil.

Chevron. The distinguishing stripes on the sleeves of non-commissioned officers of marines.

Chevy. To shake or force with a shivering motion.

Chewing Oakum, or Pitch. Said of a vessel which leaks from inefficient calking, or on account of the working of her timbers.

Chicago (Ill.), a port of entry and the most important centre of commerce in the Northwestern States, is situated at the mouth of the Chicago River, on the southwestern bend of Lake Michigan. Lat. 41° 53′ 3″ N.; lon. 87° 37′ 30″ W. The length of the city from north to south is from 7 to 8 miles, and its breadth from east to west about 5 miles; area, about 36 square miles. It is divided by the Chicago River and its branches into three parts, the north, south, and west divisions, which are connected by 33 bridges and 2 stone tunnels under the river-bed, one 1890 feet long under the main river, the other 1608 feet long, under the South Branch. Of these divisions the west is nearly double the size of the other two combined, embracing 15,104 acres, while the north contains but 2533 acres, and the south 5363 acres. The imports into Chicago during 1879 aggregated $9,000,000. The amount of duties received was $1,451,536. The exports reached the large sum of $10,000,000. The first shipment of wheat was made from Chicago in 1839, and amounted to 1678 bushels. In 1879 the receipts of grain of all kinds were 138,154,571 bushels, while the shipments were 121,094,000 bushels. Pop. 477,000.

Chief. A familiar appellation for the senior engineer on board ship.

Chief Officer, or Chief Mate. The first mate; an officer of a merchant vessel next in rank to the master.

Chief-of-staff. A line-officer who is attached to the flag-ship, and assists the commander-in-chief or flag-officer in the various details and arrangements for the management of the fleet or squadron. At present the duties of the chief-of-staff are performed by the commanding officer of the flag-ship.

Chigre. A minute insect of tropical countries, which pierces the bottom of the foot and breeds there, producing great pain. See Jigger.

Chili. This comparatively small republic, which cast off the Spanish yoke in 1810, now boasts a population of 2,000,000, an annual export trade of $19,000,000, and a revenue of $20,000,000. Its greatest enemies are its near neighbors, and to check them the state maintains a navy of 10 small steamers of 120 to 300 horse-power, and 2 powerful ironclads. These two latter vessels are each 210 feet long and 45 feet in breadth, of 2200 tons measurement, and of 2500 horse-power. The battery is amidship, and is armed with 6 12½-ton rifled guns. The range of fire in both ships is peculiar, for although they have the appearance of ordinary broadside ships, they are able, with the three guns on each side, to fire over all the points of the compass. This advantage was obtained by placing each of the fore-and-aft guns at the corners of the battery, and raising the side of the ship so as to enable the foremost guns to fire right forward and in a line with the keel, and in like manner the aft guns fire right aft. The corners of the batteries are made of an octagonal shape, so that the same guns which fire right forward and aft can be brought into the broadside position, and command any angle between them and the line of the keel. The midship guns on each side are made to fire with broadside, and also to support the fire of the forward guns.

Chilled Shot. Shot which are rapidly cooled after being cast. They are very hard but brittle.

Chimbe, Chime, or Chine. The ends of the staves which project beyond the head of a cask.

Chimbe and Chimbe. End to end; as, casks or barrels.

Chime in. To join in.

Chinckle. A small bight in a line.

Chine. To hollow out slightly. That part

of the water-way which is above the deck and hollowed out or beveled off to the spirketing. See CHIMBE.

Chinese Navy, The. The Chinese navy dates back to a period before the foundation of the British navy was laid under the last two Henrys. The art of ship-building has a great antiquity in China. The junks of to-day, unaltered as they are from designs dating centuries back, will compare favorably with the coasting craft of some Western countries now, and those in existence nearly three hundred years ago must have equaled in most respects and surpassed in many the barques, pinnaces, and caravals which sailed under the successors of Magellan and Andrade. The sea-going war-junks were often of large size, easily handled, and not bad sailers. Many of them had high bulwarks and pentagonal port-holes. Guns were mounted only on the upper deck, frequently on immovable carriages, and the crews had but the most slender knowledge of gunnery.

Early European travelers were often struck by the condition of the Chinese forces. Of the navy, one authority writes: "The greatest ships they have are called 'juncos,' which are very great and are made for the wars, with castles very high in the poop and prore, like to the ships of the Levant. There are so many of these that it is easy for any general of the sea to join together in a little time a navy of from five hundred to a thousand of them."

But from the early part of the 17th century onward, while progress in Europe was rapid, Chinese naval architecture remained stationary. When the British first came to blows with the Chinese nearly forty years ago, their army and navy were equipped in a manner which showed that but little advancement had been made since the middle of the 17th century.

"In 1876 a naval yard was established near Shanghai, and though there are a few Englishmen and Americans holding posts in it, the control of it is exclusively in the hands of native officials. Two steam-frigates of nearly 3000 tons measurement and five gun-vessels had been launched from it three years ago, and a small ironclad for river service completed. Of the frigates one was in commission, and the writer, who has seen her actually at sea, was allowed to go over her when lying at anchor near Shanghai. She is a handsome craft, completely armed with Krupp guns. Her crew from the captain down, without exception, is composed of native Chinamen. She did the Chinese credit in all respects. Attached to the dock-yard is a large military arsenal, in which are stored guns and small-arms of all descriptions, and in which projectiles for heavy and field guns and breech-loading rifles of the Remington pattern were being continuously produced. Heavy machinery for the manufacture of armor-plates was being erected in a portion of the works. On the opposite bank of the river may be seen the great powder-factory, not long ago constructed for the manufacture of gunpowder of the European kind.

"But perhaps the most marked instance of progress in this direction is to be observed at, or rather near, the treaty port of Foochow. Under the authority of the distinguished Tso-Tsung-Tang, M. Giguel, an officer of the French navy, began some twelve years ago to form a dock-yard on the Min River, a few miles below the city just mentioned, which could be easily fortified. The extraordinary success which has attended his labors will be understood by some knowledge of the difficulties with which he had to contend. The very ground on which the navy-yard is formed had to be made. The soil was alluvial, formed by a thick layer of solidified mud covered with a coating of nearly liquid clay. In consequence of the freshets in the river, the level of the ground had to be raised five feet. In spite of these and other disadvantages, M. Giguel, at the end of seven years, had iron-works, rolling-mills, engine-factories, and building-slips—in fact, all the plant of a naval yard—in full working order; and had actually built the engines, and, in some cases, the armament for no less than fifteen vessels, of which eleven were over 1000 tons displacement. Not only this, but a school for naval officers had been formed, and a training-ship, fitted to make cruises at sea, had been attached to the establishment.

"Even this account of several great arsenals would not exhaust all that might be said in description of what has recently been done in China to increase the efficiency of the army and navy, which she has begun to consider necessary to her well-being."

The Chinese do not rely entirely upon their own dock-yards constructors. In addition to the fleet of native production, they have recently had constructed in England a series of gunboats of the latest types, armed with the most improved and heaviest guns.

In 1876–78 four gunboats were completed at the works of Sir William Armstrong for the Chinese government, of the British "Staunch" type, designed by a member of the firm, the talented engineer, Mr. G. W. Rendel, but in which several important improvements upon that type were introduced. These boats were named "Alpha," "Beta," "Gamma," and "Delta." The first two are each 118 feet long and 27 feet beam, with a mean draft of 7 feet 6 inches, and a displacement of 319 tons. The last two are 120 feet between perpendiculars by 30 feet beam, having a draft of 8 feet and a displacement of 400 tons. They are schooner-rigged, with tripod masts, are propelled by twin-screws, and can steam 9 knots per hour.

But the increased dimensions of these last two vessels were of trivial importance compared with the difference in their armament; for while the first two carry each a 26½-ton gun, the others carry each a 38-ton gun of the British service pattern. The mounting of these guns on vessels of only 400 tons displacement was a most daring innovation, and its boldness becomes more apparent when we remember that the only guns of the same weight and calibre then afloat were the two in the fore-turret of the great British ship "Thunderer," and that vessels of the size of these generally carried guns not exceeding 5 or 6 tons in weight, and even the "Staunch," considered a serious innovation, a gun of only 12½ tons weight.

The system of working these guns is noticeable, the piece being so much heavier than those used in the English boats, and the little vessel herself being made to act as the gun-carriage. The gun is worked by hydraulic power, and the entire arrangement of the mechanism is similar

to that employed by the Italians in working the 100-ton gun at Spezia. Two heavy iron beams in the fore part of the vessel are placed side by side, on a level with the deck and parallel with the keel; on these beams are bolted frames analogous to the cross-head guides of a horizontal engine, and the trunnions of the gun are fitted in side-blocks, these last taking the place of the cross-head. Thus arranged, the gun can slide back and forth through a range of about three feet. The preponderance at the breech-end is supported by two secondary parallel bars inside the main gun-beams. These are hinged at the rear end, while at the forward end they are carried on the cross-head of a vertical hydraulic ram fixed beneath the deck. The breech-end of the gun is supplied with a hoop and lugs; the lugs rest on the two secondary bars near their hinged ends, and thus, by causing the hydraulic ram to rise or fall, the gun can be elevated or depressed at will. No turning gear is provided, the lateral training of the gun being effected by turning the whole boat through the required arc by the use of the rudder and twin-screws. To run the gun in and out, two hydraulic cylinders are used, one of which is fixed horizontally on each side-beam, the cross-heads of the rams taking hold of the trunnion side-blocks. The recoil is taken up by these rams, or, more properly, pistons, delivering water under a weighted valve. The gun is loaded by a hydraulic rammer, the shot being brought to the muzzle by a trolley or carriage, off which it is pushed into the bore.

During the trials of the "Gamma," the 38-ton gun was fired with charges consisting of 130 pounds of powder behind an 800-pound projectile, the elevation being 3½ degrees. The initial velocity was 1500 feet per second, and, as tested at Shoeburyness, capable of penetrating 19½ inches of iron in three thicknesses, sandwiched with 10 inches of teak. In addition to the heavy guns, two 12-pounders are also carried, and a machine-gun of the Gatling type.

These vessels are iron-built, and each carries 50 tons of coal and 50 rounds of ammunition. They all made successful passages to China, the first two being delivered at Foochow in 1876, and the last two at Tientsin in 1878.

But the Chinese did not stop with the construction of these four boats. Four more, built on the Tyne under the supervision of the Elswick firm, and armed each with a 35-ton gun of the Armstrong new type, sailed from England in July, 1879, for China. These boats, or "floating gun-carriages," are substantially of the same design and construction as those which have already been described. The most important difference is that they are built of steel instead of iron, and are double-ended, the stern and bow lines being after the same model, and are fitted with bow rudders, which enable them to steam either backward or forward. The bulwarks have been heightened to give additional cover to the men.

In addition to the vessels already described, there have also been built in England for the Chinese navy eight small gunboats, of from 100 to 220 tons displacement, each carrying from 2 to 7 guns.

At the Foochow arsenal there have been built seventeen composite gunboats, each mounting one 7-ton or 9-ton gun with other light pieces, one composite corvette, carrying 11 guns, one of 11 tons weight, and three transports. There are also the two wooden frigates and the five gun-vessels already mentioned as constructed at Shanghai. All of these vessels are now doing duty in southern waters.

In addition to these gunboats, the Chinese have determined to still further equip themselves for coast defense by providing a supply of torpedo-boats, and the first of the series proposed, an experimental boat, was shipped from England to China in August, 1879. Its dimensions are as follows: length, 52 feet; breadth, 7 feet; mean draft of water, 3 feet 6 inches; maximum speed, 16 knots per hour. It is built of steel, is divided by six water-tight compartments, and is arranged to work three spar-torpedoes.

The Chinese authorities have also taken the initiative step in the formation of an ironclad fleet, by ordering from Messrs. Mitchell & Co., on the Tyne, England, a double-turreted steel armor-clad, to have a speed of 16 knots, the machinery to be built by Hawthorne, of Newcastle.

Chinse. To stop small seams by working in oakum with a knife or small iron when the seam will not bear the force required for calking.

Chinsing-iron. A light calking-iron.

Chip. The triangular piece of wood attached to the log-line. See Log.

Chips. The familiar sobriquet of the carpenter on board ship.

Chit. A note; an I. O. U. In China they have a silver currency which being inconvenient to carry, credit is universally given by the merchants, the purchaser giving a *chit*, which is presented for settlement at the end of the month.

Chit-book. A book of printed forms for chits.

Chiton. A mollusk with a many-jointed shell covering its back.

Chiule. A Saxon ship.

Chivey. A knife.

Chock. Entirely; quite; as, *chock-full*, *chock-home*, *chock-aft*, etc. A sort of wedge used to prevent a cask, or any other heavy body, from moving. Also, a small piece of wood fitted neatly into a larger piece of timber, in order to make good some deficiency in the main piece. Also, a piece sometimes placed between the head of the lower mast and the head of the topmast.

Chock-a-block. See Block-and-block.

Chock-channels. Channels with the spaces between the chain-plates filled in with wood.

Chock of the Bowsprit. A wedge-shaped piece fayed to fit the hole above the bowsprit, after the bowsprit was shipped, in order to secure it.

Chock of the Rudder. In former times a piece of timber fitted and kept in readiness to stop the motion of the rudder in the case of any accident, and while a new tiller was being shipped.

Chocolate-gale. A brisk N.W. wind of the West Indies and Spanish main.

Chogset. See Burgall.

Choke. The nip of a rocket. To foul; as, a rope in a block. *To choke the luff*, to thrust the hauling part of a tackle close up to the block, under the other parts, thus jamming the hauling part and keeping the tackle from rendering.

Chokey. *In chokey*, in jail; in the brig.

Chommery. Jack's word for *chasse-marée*, a French coasting-vessel.

Chop (*Chinese*). A permit, or clearance. Quality; as, first chop, second chop, etc. A device or trade-mark.

CHOP-BOAT. A licensed lighter employed in transporting goods.

CHOP-DOLLAR. In China, when the silver dollar passes into a bank or large mercantile house it is tested and stamped; in the course of time these impressions become so numerous that the piece of silver bears little resemblance to the original coin. From the resemblance which one of these coins bears to the face of a person badly marked with smallpox, the individual so marked receives the sobriquet of *chop-dollar*.

Chop About. When the wind changes its direction suddenly it *chops about*.

Chopping-sea. Tumbling waves dashing against each other.

Chops. The junction of a channel with the sea; as, the chops of the English Channel.

Chow. See CHOW-CHOW.

Chow-chow. A word from the Chinese, meaning eatables.

CHOW-CHOW CHOP. The lighter containing the articles which complete a ship's cargo.

CHOW-CHOW WATER. Strong cross-currents and eddies in which vessels are difficult to manage.

Chowder. A dish made of pork, biscuit, onions, etc., and fresh fish or clams.

Chowder-head. A stupid fellow.

Christening a Ship. The present system of "christening" ships may be considered a relic of the ancient libation practiced when they were launched. The action of "blessing" ships is alluded to by the monks of St. Denys. In July, 1418, the Bishop of Bangor was sent to Southampton to "bless" the king's ship, the "Grâce Dieu," and received £5 for his expenses. In the fleet commanded by John de Outremarins against the Tunisians, according to ancient custom and to insure success, the ships were blessed by the priests; and being afterwards exposed to storms, the captains desired the soldiers and sailors to invoke the Lord, and while they were at prayer the wind became suddenly favorable. In 1242, when Henry III. was at war with France, a fleet was prepared in which that monarch embarked, after visiting the shrines of many saints, to propitiate their influence against storms, and to insure success to his arms. Before the Reformation it was usual for the priests at Yarmouth to give a blessing to the fishing-vessels yearly, and it was afterwards customary for the minister of the parish to preach a "fishing" sermon.

Christian. A gold Danish coin.

Christiania. The capital of Norway, situated at the head of the Christiania-Fiord, in lat. 59° 54′ 1″ N., lon. 10° 45′ E. The fiord is frozen for two months of the year from about 20 miles from Christiania to the sea, and the harbor is generally locked up for three or four months. Pop. 100,000.

Christiansand. A town of Norway, near its southern extremity, on a fiord of the Skager-Rack, 157 miles southwest of Christiania. Lat. 58° 8′ N.; lon. 8° 3′ E. The harbor is deep and well sheltered, and is defended by several batteries and by the fort of Christianholm, on the small island of Odderö, at the entrance of the harbor. Pop. 13,000.

Christian's Gales. The fearful gales of 1795–96, which nearly destroyed a fleet under Admiral Christian while on his way to attack the French West India Islands.

Chrockle. A thorough-foot (which see).

Chronometer (Gr. *chronos*, time; *metron*, a measure). A time-piece of superior construction, having adjustments and compensations for changes of temperature. The proposition to determine the longitude at sea by means of a time-piece and observation of the heavenly bodies was made by Gemma Frisius in 1530. In 1714 the British government offered a reward of £20,000 to the person who should so perfect this method as to determine the longitude within 30 miles. In 1758 John Harrison received this reward, his chronometer having shown an error of 18 miles during a five months' voyage. At the present day, under favorable circumstances, longitude determined by a chronometer can be relied upon to within two or three miles, and even this small error is due rather to the faults of observation than to the imperfections of the instrument. A sea-chronometer has for its moving-power a spring, the force of which is made uniform by a variable lever; it is carried through all varieties of climate, and is therefore furnished with an expansion balance, formed by a combination of metals of different expansive qualities.

In carrying a chronometer to and from the ship the gimbals are steadied by the stay, and care is taken not to give the instrument a circular motion. When on board, the chronometer is placed in a position not exposed to currents of air nor to sudden shocks, such as are occasioned by the striking of a sea against the side, or by the firing of salutes, etc., and metallic substances are kept at a distance from it.

The chronometers in use on board ship are generally constructed to run for 56 hours, but they are wound every day at 8 A.M. In winding it is handled carefully and the key turned steadily; a pocket-chronometer is held immovable in one hand in order to avoid a circular motion. If a chronometer should run down, it is started by giving it a quick circular motion in the plane of the dial; the hands are never touched. As no chronometer is absolutely perfect, the navigator ascertains its error and makes allowance for it. Three chronometers are supplied to government vessels, and they are compared with each other every day; a sudden change in one will be shown by the other two.

CHRONOMETER, ERROR OF. The error of the chronometer is the difference between the time indicated by it and any other given time. The error is *fast* or *slow* as the chronometer is in advance of or behind the time in question. Before sailing the navigator must know the error of his chronometer. It can be determined in a variety of ways, the most reliable of which is a comparison of the chronometer with the clock of an observatory. The general use of time-balls renders the clocks of the observatories available to everybody. In our ports the time at noon is always received at the telegraph-offices from the naval observatory at Washington. If unable to compare the chronometer with the clock of an observatory, the error is found by means of a sextant and an artificial horizon, either by a time-sight of the sun or star, or by equal altitudes of the sun or star.

CHRONOMETER, RATE OF. The *rate* is the daily

change of error; it is *gaining* when the chronometer is running too fast; *losing* if too slow. The rate is determined by finding the error on different days, and dividing the change of error by the number of days elapsed between the observations. On arrival at the first port after the beginning of a cruise, the navigator will generally find that the error of his chronometers, as shown by an observation or by comparison with an astronomical clock, does not coincide with the error shown by the rate obtained before sailing. By dividing the difference between this new error and the error on the day of sailing by the number of days elapsed a new rate is obtained, which is called the *sea-rate*, and thereafter is always made use of when at sea.

Chub. The *Leuciscus cephalis*, a fresh-water fish.

Chuck. A sea-shell. See Chock.

Chuckle-head. A stupid fellow; a lubber. A person with a large round head.

Chunam. A cement used in the East for the seams of ships. It becomes very hard, and when of good quality will take a polish.

Chunk-block. A strongly-made block, having a metal sheave and a large swallow.

Church. *To rig church*, to arrange the seats, altar, etc., for divine service on board ship. *To unrig church*, to clear up the decks after service.

Chute, or Shoot. A pipe or channel for conveying ashes, refuse matter, and other articles down to a lower level.

Cigar-boat. A peculiar boat shaped like a spindle, constructed by Winans.

Cingle. A belt worn by sailors.

Cinque Ports, The. These are five highly privileged stations, the once great emporiums of British commerce and maritime greatness; they are Dover, Hastings, Sandwich, Romney, and Hythe, which, lying opposite to France, were considered of the utmost importance. To these were afterwards added Winchelsea, Rye, and Seaford. These places were honored with peculiar immunities and privileges, on condition of their providing a certain number of ships at their own charge for forty days. Being exempted from the jurisdiction of the admiralty court, the Lord Warden of the Cinque Ports is authorized to make rules for the government of pilots within his jurisdiction, and in many other general acts exceptions are provided to save the franchises of the Cinque Ports unimpeached. It is a singular fact that it has never been legally determined whether the Downs and adjacent roadsteads are included in the limits of the Cinque Ports. All derelicts found without the limits by Cinque Port vessels are droits of admiralty. This organization was nearly broken up in the late state reforms, but the Lord Warden still possesses some power and jurisdiction.

Cipango. A marvelous island described by Marco Polo, and represented as lying in the eastern seas, 1500 miles from the mainland. It was an object of diligent search with Columbus and the early navigators. It is supposed by some to be the same as Japan. (Written also *Lipangi.*)

Circinus. The Roman compass. See Constellation.

Circle. A plain figure bounded by a curve, every point of which is equally distant from a point within it. The line bounding a circle.

Circle, Astronomical. A reflecting instrument for measuring angles, in which the limb is a complete circle of metal; as, the mural circle, reflecting circle, repeating circle, etc.

Circle, Diurnal. The diurnal circle of a heavenly body is the circle it describes in the apparent daily revolution of the celestial sphere. It is the parallel of declination passing through the body; only when the body is in the equinoctial is it a great circle. At the equinoxes the sun's diurnal circle is the equinoctial; at the summer and winter solstices, its diurnal circle in the heavens corresponds to the tropics of Cancer and Capricorn on the surface of the earth.

Circle, Hour. A great circle of the celestial sphere perpendicular to the equinoctial, and therefore passing through the poles of the heavens. See Co-ordinates for the Surface of a Sphere.

Circle of Altitude, Declination, Latitude. In the different systems of co-ordinates for the surface of the celestial sphere, it is the common practice to regard the secondary great circles as ordinate circles to the primitive, and they are hence named after that one of the co-ordinates which is measured *upon* them. Thus, the great circles which are ordinate circles to the horizon are called *Circles of Altitude*, because altitudes are measured upon them; the great circles which are ordinate circles to the equinoctial are called *Circles of Declination*, because declinations are measured upon them; and the great circles which are ordinate circles to the ecliptic are called *Circles of Latitude*, because latitudes are measured upon them. Under a different system of nomenclature these are severally called *Circles of Azimuth*, *Circles of Right Ascension*, and *Circles of Longitude*. See Co-ordinates for the Surface of a Sphere.

Circle of a Sphere. A circle on the surface of a sphere; when its plane passes through the centre of the sphere it is a *great circle;* in all other cases it is a *small circle.*

Circle of Azimuth, Right Ascension, Longitude. In the different systems of co-ordinates for the surface of the celestial sphere, some writers allow the conception of polar co-ordinates to predominate, and thus regard the secondary great circles as sweeping out angles at the pole; they therefore name them after that one of the co-ordinates which is marked out *by* them. Thus, the great circles passing through the poles of the horizon are called *Circles of Azimuth*, because they each mark out all points which have the same azimuth; the great circles passing through the poles of the equinoctial are called *Circles of Right Ascension*, because they each mark out all points which have the same right ascension; and the great circles passing through the poles of the ecliptic are called *Circles of Longitude*, because they each mark out all points which have the same longitude. Under a different system of nomenclature these are severally called *Circles of Altitude*, *Circles of Declination*, *Circles of Latitude*. See Co-ordinates for the Surface of a Sphere.

Circle of Illumination. Approximately one-half of the earth's surface is always illuminated by the sun, while the opposite hemisphere is in the shade. The great circle which at any instant is the boundary between the illuminated and darkened hemispheres is called the *Circle of Illumination.*

CIRCLE OF PERPETUAL APPARITION. A circle within which the heavenly bodies are always above the horizon.

CIRCLE OF PERPETUAL OCCULTATION. A circle within which the heavenly bodies are always below the horizon.

CIRCLE, POLAR. The polar circles are small circles of the terrestrial sphere, parallel to the equator, and 23° 28′ distant from the poles. The northern is the *arctic*, and the southern the *antarctic* circle.

CIRCLE, VERTICAL. A great circle passing through the zenith; the prime vertical passes through the east and west points of the horizon.

Circuit. A continuous electrical communication. A metallic circuit is one in which a return wire is used. To *short circuit* a battery is to connect its poles by a conductor whose resistance is practically zero.

Circular. An official letter, generally printed, copies of which are sent to several persons.

Circulating Pump. A pump used in connection with surface-condensers for circulating the refrigerating water through or among the tubes. It may be driven either directly by the reciprocating parts of the main engine, or by the intervention of beams or levers, or by an independent engine. In the latter case rotary pumps are much used. The refrigerating water is drawn through a pipe passing through the side or bottom of the vessel, and discharged, after having done its work, through another pipe, at or near the load water-line. Both of these pipes can be closed at the ship's side by valves called, respectively, the "injection valve" and the "outboard delivery valve." A branch suction-pipe, controlled by a valve, leads to the bilge, affording powerful means of freeing the vessel of water in cases of extraordinary leakage. See CONDENSER.

Circummeridian (Lat. *circum*, about). About or near the meridian. Circummeridian altitudes are taken when the body is near the meridian. See ALTITUDE.

Circumnavigate. To sail round; to pass around by water.

Circumpolar. Situated about the pole.

Cirripedia. A group of marine animals, allied to the *Crustacea.* They are free and natatory when young, but in the adult state attached to rocks or some floating substance. They are protected by a multivalve shell, and have long ciliated curled tentacles, whence their name (*curl-footed*). The barnacles (*Lepas*) and the acorn-shells (*Balanus*) are familiar examples.

Cirro-cumulus. See CLOUD.

Cirro-stratus. See CLOUD.

Cirrus. See CLOUD.

Cisco. A fish of the herring kind, of which thousands of barrels are annually taken and salted in Lake Ontario.

Cit. A citizen.

CITS. Citizen's clothing.

Citizen. In the United States, a person, native or naturalized, who has the privilege of voting for public officers, and who is qualified to fill offices in the gift of the people. (See ALIEN, NATURALIZATION.) The word is often used to distinguish a person engaged in civil pursuits from members of the military and naval services.

City of Masts. A name applied to London in allusion to the magnitude of its commerce.

Civil. The civil *time*, *day*, *year*, is that reckoning which is adopted for the social purposes of life. See TIME, DAY, YEAR.

Civil Engineer. See ENGINEER, CIVIL.

Civil Lord (*Eng.*). The junior member of the admiralty board.

Civil War. A war between subjects of the same realm, or between factions of the same state.

Civita Vecchia. A seaport city of Italy, on the Mediterranean, 38 miles by rail W.N.W. of Rome. Pop. 11,640. The port, which owes its origin to the Emperor Trajan, is one of the best in Central Italy. Two large moles form the harbor, and a breakwater outside protects the shipping from heavy seas; a light-house is erected on its southern end. Lat. 42° 5′ N.; lon. 11° 45′ E. The harbor has depth of water for vessels of 400 or 500 tons, and ships of greater draft may anchor inside the breakwater. The city has regular steam communication with the chief Mediterranean ports.

Clake. A name for the barnacle goose (*Anser bernicla*), and also for the *Lepas anatifera*, a cirriped often found attached to vessels or timber by a long fleshy peduncle.

Clam. A well-known bivalve shell-fish of different genera; as, the *Venus mercenaria*, the *Mya arenaria*, and others. *As happy as a clam at high water*, a figurative expression for indolent comfort.

Clamber. To ascend; to climb.

Clamps. The strakes of plank on which the deck-beams rest.

CLAMP-NAILS. Nails used to fasten the clamps.

Clang. The rattling and clashing of arms.

Clap. A burst of sound; as, a clap of thunder.

CLAPPER. The tongue of a bell.

Clap-match. A sort of seal distinct from the fur-seal.

Clap On. *To clap on* to a rope is to lay hold of it in order to haul upon it. *To clap on a stopper* is to put on a stopper; stop talking. *To clap on canvas*, to make more sail.

Clap-sill. The lockage of a flood-gate.

Clark, Ezra W., Chief of U. S. Revenue Marine. Born at Granville, Licking Co., O., in 1839, his father being Rev. Ezra W. Clark, for about forty years a clergyman of the Baptist Church in Ohio. After receiving a rudimentary education he was, at the age of twelve years, apprenticed to the printing business. Having acquired this trade he was prepared for college at Lima, N. Y. Subsequently he pursued the study of Mathematics with Prof. Aaron Schuyler, president of Berea College, O. He attended college at Otterbien University, in Ohio. He studied law with Hon. John K. Hord, of Tiffin, O. In April, 1861, he entered the Union army, and was a private soldier and subsequently a captain in the 8th Regiment Ohio Vols. Later, he was adjutant of the 34th Ohio infantry; was appointed assistant adjutant-general of volunteers by President Lincoln in 1863; served as such in the army of West Virginia, and was assistant adjutant-general of a cavalry division under Gens. Hunter and Sheridan in the campaigns of 1864. He was afterwards transferred to the staff of Maj.-Gen. W. S. Hancock, and became assistant adjutant-general of the Middle Military Grand Division, headquarters at Washington, D. C., and was transferred to Bal-

timore with Gen. Hancock when the latter assumed command of the Middle Department. In the beginning of 1866, the war being over, he left the army and entered the legal profession. He was admitted to the bar of the Supreme Court of the District of Columbia, and afterwards to the bar of the Supreme Court of the United States. In 1871 he was appointed assistant chief of the revenue marine, and, with Mr. S. I. Kimball, participated in the reorganization of the revenue marine service and the life-saving service. He was appointed chief of the revenue marine July 1, 1878. In addition to his duties in charge of this bureau, he is a member of the examining board of the Treasury Department, to examine applicants for admission and promotion to clerkships in the Department; also a member of the board designated by the Secretary of the Treasury to consider all matters pertaining to Alaska.

Clarty. Wet; slippery; dirty; sticky.

Clary, Albert G., Commodore U.S.N. Born in Massachusetts. Appointed, 1832; attached to sloop "Vincennes," Pacific Squadron, 1834–36; Naval School, New York, 1837.

Promoted to passed midshipman, July 8, 1839; sloop "Marion," Brazil Squadron, 1839–42; receiving-ship, Boston, 1843–45.

Commissioned as lieutenant, April 11, 1845; sloop "Preble," Home Squadron, during the war with Mexico, at Tuspan and Tabasco; sloop "Preble," Pacific Squadron, 1847–50; receiving-ship, Boston, 1852; sloop "Marion," coast of Africa, 1853; frigate "Constitution," coast of Africa, 1854–55; navy-yard, Portsmouth, N. H., 1856–57; steam-frigate "Minnesota," East India Squadron, 1858–59; steam-frigate "Colorado," 1861; commanding steamer "Anacostia," Potomac Flotilla, 1861; engagement at Acquia Creek, May 31 and June 1, 1861; battle of Port Royal, November 7, 1861.

Commissioned as commander, July 16, 1862; commanding steamer "Mount Vernon," North Atlantic Blockading Squadron, 1862; commanding steamer "Tioga," West India Squadron, 1863; commanding steam-sloop "Dacotah," North Atlantic Blockading Squadron, 1864; commanding steam-sloop "Seminole," West Gulf Blockading Squadron, 1864–65; commanding receiving-ship, Norfolk, 1866.

Commissioned as captain, November 21, 1866; commanding "Dictator," 1870–72. Commissioned as commodore, 1873; retired, 1874.

Clashy. Showery.

Clasp-hook. A clip-hook (which see).

Class. A group of objects, animate or inanimate, which possess common characteristics. A number of students of the same standing, or who are pursuing the same studies.

Classification of Men-of-War. *First-rates* will comprise steamships of 4000 tons displacement and upward; ironclad steamers of 3000 tons measurement and upward; ships-of-the-line commissioned for sea-service.

Second-rates will comprise steamships of 2000 to 4000 tons displacement; ironclad steamers of 2000 to 3000 tons measurement; frigates (sailing) commissioned for sea-service.

Third-rates will comprise steamships of 900 to 2000 tons displacement; ironclad steamers of 1200 to 2000 tons measurement; sloops-of-war (sailing) commissioned for sea-service.

Fourth-rates will comprise steamships below 800 tons displacement, dispatch-vessels, and store-ships.

Whenever a vessel is commissioned as a receiving-ship, her rate will be decided by the Navy Department.

Classification of Merchant-vessels.

		American Lloyd's.	British Lloyd's.	French Veritas.
1st Class.	1st Grade 1st Class.	A 1	A 1	3.3 1.1
	2d " "	A 1-	"	" "
	3d " "	A 1½	"	5.6 1.1
2d Class.	1st Grade 2d Class..	A 1½-	A 1 (in red)	5.6 2.1
	2d " "	A 2	*Æ 1 (in red)	" "
3d Class.	1st Grade 3d Class..	A 2-	Æ 1	3.4 2.1
	2d " "	A 2½	Æ 2	2.3 2.2

The degrees of first and second class will imply confidence for the transportation of perishable cargoes on long voyages. The degrees of third class will not imply confidence for the conveyance of cargoes in their nature subject to sea damage.

The classification of shipping depends upon the quality and dimensions of materials used, the equalization of strength in their distribution in scarfs, laps, and butts, with mode and extent of fastening. Model and manner of construction must accord with the best practice of ship-building, for all grades. The sparring must be in good proportion, and all equipments efficient.

The frame, head, and heels of timber must be square, and free from sap or decay; the timber well seasoned, salted or pickled when in progress of construction; ventilation preserved fore and aft; and a water-course made on under side of floors to admit the water to the pumps.

The frames must be of white oak, the principal timbers of live-oak or other timber of equal durability, and the tops of frames mixed with red cedar, hackmatack, locust, or white-heart chestnut. The butts must be distributed out of line; the timber scarfs not less than 4 feet 6 inches long; the floor timbers extending well towards the ends of the ship; the heels of the cants stepped in the dead-wood and bolted through with copper; the wing and main transom well kneed and connected to the frames.

The keel must be sided of sufficient size to admit of twice the thickness of the outside plank between rabbets on stem and stern-post, the rabbets to extend as far as practicable, to admit of fastening the wood ends thereto. The heel of stem must be a crook, and stepped in a hooked scarf on the keel, and not less than 3 feet 6 inches long. The stern-post must also be stepped in the keel.

Natural crooks are preferred for rising floors and second futtocks. The siding of timbers must be in proportion from floor-heads to heads of top-timbers; the distance at centres for all vessels of 800 tons and under must not be over 26 inches, and vessels over that tonnage not over 30 inches.

The keelson must be sided not less than size of keel, and the scarfs not less than 7 feet long; if single keelson, the shifts of scarfs to be at least one-third the length of the stick from the end of the scarf of the keel. In rider keelson the scarfs must not be less than six feet long; assistant keelson, if adopted, to be well bolted to first futtocks and to main keelson. The scarfs must be distributed so as not to be under the heel of a mast.

The beams must be of oak or yellow pine of

sufficient size and 6 feet from centres, except for hatchways, and securely fastened to the side by knees carefully fitted to the timber, natural crooks. The lodge- and bosom-knees must be of oak or hackmatack. Seasoned oak or hackmatack is preferred for hanging-knees; vessels of 200 tons are required to have a hanging-knee of wood or iron under each end of each alternate beam; if over 200 tons, to have a hanging-knee under each beam, the arms of good length, not less than 3 feet 6 inches; the knees to be fastened with through bolts driven from outside and clinched over rings, in addition to the blunt bolts driven from the inside, and each hanging knee must be keyed to the beam.

The breasthooks and pointers must be square-fastened, one-third of the bolts driven from the outside through the timbers and clinched over rings on the inside, and all blunt bolts must be driven within one inch of through. Copper or composition bolts must be driven through the apron and inner stern-post not over 20 inches apart and clinched over rings of the same material on the outside. Copper or composition bolts must be driven through the dead-wood 20 inches apart, passing through the heels and scarfs of stern and stern-post and clinched over rings on the outside and lower side of keel.

Spar-deck water-ways must be fayed to the beams and timbers, the scarfs vertical, and at least three planks next the water-way must be one inch thicker than the adjoining plank, and alternately let one inch into and one inch over the beams and carlines, the edge bolted through water-ways and timbers, and clinched. The main and inner water-ways on lower decks must be cogged to the beams with locust, bolted through each beam and clinched, and bolted from outside through each timber and clinched over rings. The clamps and inside planking must be of good length, the clamp-scarfs to be hooked or keyed, arranged to suit the timbers, and in length not less than five times the length of the plank. The ceiling must be of good quality, the butts properly shifted, the whole square-fastened, and the edges beveled to good calking seams. In all cases the nibs of the butt-scarfs must be one-third the width of the planks, and reach the frame forward and abaft of their centres.

The outside planking must be of white oak or yellow pine, and fit closely to each other on the inside. The garboard streaks must be, at least, from 3 to 1½ inches thicker than the rest of the covering. No butts in any part of the planking must be nearer than 5 feet of each other, unless there be a streak wrought between them, when a distance of 4 feet will be the minimum; all butts on the same timber must have 3 streaks between. Vessels under 200 tons are exempt from the full operation of this rule.

Deck-planks must be of white or yellow pine of best quality, and not less than 30 feet in length; no planks to be over 5½ inches wide and 3 inches thick, and fastened with two copper spikes in the butt of each plank; rail-scarfs must be hooked or keyed, and in length 5 times their width. Stanchions under deck-beams must be of oak or pitch-pine.

Garboards, first and second, must be bolted to the floors with copper or composition driven through each frame and clinched, and edge bolted through keel and each other in addition to treenailing. All bolts going into the timber must be driven within one inch of through, and the plank, well wrought to the timbers with copper or composition spikes, must be square-fastened with locust treenails of best quality driven through and wedged, outside and in; when the plank is 6 inches wide, then to be treenailed single and double in each frame; when 10 inches, to be square-treenailed. Each plank must be fastened with at least one headed copper or composition bolt driven through the first frame and aft the butt, and clinched over rings on the inside of ceiling.

Each alternate floor must be fastened to the keel with a copper bolt driven from above and clinched on the under side of the keel. The intermediate floors must be fastened with a copper bolt driven through the main keelson and clinched on the under side of the keel. If a "rider keelson" is added, it must be fastened with one iron bolt in each floor through the rider to within one inch of the lower part of the keel. The vertical bolting in the assistant keelsons to be driven through the first futtocks.

In calking, the seams must be well filled with oakum thread, 50 feet to the pound, and at least one thread to each half-inch of the thickness of the plank.

Ships exceeding 5 times their breadth in length should be iron strapped diagonally.

The timber used in all vessels must be free from sap and decay. The stem above the forefoot must be of one piece, or if scarfed, the scarf must be above light-water line. Stern-post must be of one piece. Scarfs of keel not to be under a mast. Bilge streaks to correspond to tonnage. Vessels of 800 tons and over should have a heavy stringer under the lower knees.

Channel-bolts must be driven through the frames and ceiling and clinched or keyed. The partial fastenings of ceiling and outside planking must be complete before the treenail holes are bored, and care should be taken not to split the plank in driving the treenails. The pumps of vessels must correspond to their tonnage, and be so distributed that they may free the ship from water at any time or inclination; the pump-well must be accessible at all times. Vessels when wormed will not be classed until defects are removed. All vessels must have anchors, cables, boats, compasses, charts, leads, lead-lines, etc. Vessels trading to ports beyond the Cape of Good Hope or Cape Horn must have two suits of courses, topsails, jibs, spankers, and fore-topmast stay-sails, and be metal sheathed within one foot of load-line. Other vessels should carry a spare topsail and fore-topmast stay-sail.

Vessels having two decks should have scuppers through the water-ways of lower deck. Vessels transporting dry cargoes should have their masts coated. Vessels over-sparred or deficient will not receive classification. Vessels whose bowsprits step below the spar-deck, or whose hawse-holes are cut below the spar-deck, are subjected to a lower classification.

New vessels are to be surveyed while building at the following stages: when the keel and keelson are united; when the frame is raised and the keelson in; when the deck frames are complete; when treenailed and butt and bilge bolted; when masted and fully equipped. When old vessels are examined for classification particular atten-

tion is directed to the state of the upper and main deck and coamings; the upper and lower deck bolts; the knees, beams, plank-shears, and water-ways; the hawse timbers, breast-hooks, aprons, transoms, floor, and keelsons; the rudder, keel, windlass, planking, and treenails; the frame exposed, and inner surface of planking. A listing should be taken out of the ceiling above floor-heads; also, a short plank taken out under each tuck, and at such other places as may seem necessary. The sheer and general line of the ship, and the condition of the oakum and calking, are examined.

Requirements for Grades of Classification.—Vessels properly constructed and equipped class A 1 for 12 years; if opened and bored at the expiration of that term and found sound, the class is continued for such a period as the surveyors may determine.

When vessels are built with floors of oak, birch, and beech, futtocks and top-timber of oak and hackmatack, covering of oak, scantlings of good size, and materials and workmanship first-class, they will receive the A 1 class 9 years, at the expiration of which, if found sound, the class will be continued for 3 years.

When vessels are built of mixed woods, such as birch, beech, elm, hackmatack, fir, pine, hemlock, spruce, etc., the treenails through ceiling and wedged outside and in, with butt bolts in plank, and all other parts fastened sufficiently, and deck frames secured by lodge- and hanging-knees, they will receive class A 1 8 years.

Ships with depth of hold exceeding 23 feet will be required to have orlop-beams, secured with horizontal and hanging knees; when exceeding 25 feet, to have three full decks. Single-decked vessels, with depth of hold exceeding 12 feet, to have partner-beams and secured with knees and masts wedged in partners.

Single-decked vessels, when built of standard materials, with depth of hold not exceeding 11 feet, the fastenings in accordance with the rules set forth, will receive the same class as double-decked vessels; when built of other materials, they will be classed in accordance with quality of materials and construction.

Centre-board vessels of superior construction, with oak frames and coverings, all fastenings first-class, moderately sparred, and the centre-board trunk well secured, will class A 7 years; when built inferior to this grade, they will be classed in accordance with quality of build.

Vessels having their centre-boards taken out will be required to have the floor timbers run across to meet the second futtocks, and chocks put in to meet the first futtocks.

When vessels are rebuilt or thoroughly repaired, they will be restored to original character if the materials used are equal to the original.

Iron Vessels. The classification of iron vessels depends on the quality of iron, mode of construction, dimensions of plating, frames, and angle-iron, the distribution of scarfs and butts, etc.

Neither steam- nor sailing-vessels must exceed seven times their breadth in length; the latter to have two bulkheads, and the former not less than four, and secured with angle-iron equal in size to that of frames; the distance of frames at centres must not exceed 20 inches.

The keel, stern, and stern-post must be of solid iron, the scarfs to be in length eight times the thickness of the material. Propeller-posts are required to be in thickness double that of keel, and to taper off along the line of keel; the whole to be well united.

Floor-plates must be fitted closely to the keel, riveted to every frame, and extend across the stern-post and above the bilges, that the sides may be properly connected. The depths of plate must be one-twelfth the depth of hold, measured from top of keelson to upper deck beams; and a water-course to be preserved to admit the water to the pumps. A reduction in size of plates will be allowed towards the ends of the vessel.

The keelson must be two-thirds the depth of floor-plates, and extend to stem and stern-post, and be connected thereto; the butts must be properly shifted, well fitted, and riveted to floor-plates. Angle-iron must be fitted on top and bottom of vertical plating, and riveted to the reversed angle-iron on top of floors. Additional keelsons are required for vessels of 800 tons or over.

The frames must be of the greatest possible length, the butts well shifted and fitted closely to the keel. The frames, if welded, must be perfect, and the whole strengthened with reverse angle-iron. All vessels must have double frames to above the bilges.

The beams must be one-quarter of an inch in depth for each foot of length of midships beam. The angle-iron must be of good size, the two sides of each not less in breadth than three-fourths the depth of beam-plate. The beams to be all well connected to the frames with bracket ends of knee-plates equal in thickness to beams, and the arms to be three times the depth of beams.

In vessels having three decks, the beams must be over each other, and stanchioned where practicable; the orlop-beams must be fastened to every sixth frame, and have stringer-plates and angle-iron on their ends fore and aft. Vessels of 20 feet depth must have the same number of hold and deck beams. A depth of hold of 16 feet must have beams to every fourth frame, and secured with knee-plates and to stringer-plate at under side.

All vessels must have stringer-plates on each tier of beams, connected at ends with angle-iron, and also to frames and outside planking. The clamps must be equal in dimensions to the stringers, and riveted to each frame. The tie-plates must be well riveted to each other, and to beams, hooks, and transoms, and the butts well shifted. When the deck arrangement will admit of it, all vessels are to have diagonal tie-plates. The hatchways, mast-holes, and partners must be strongly framed and secured with angle-irons and carlines.

All butts must be double riveted, and the plating closely fitted to the frames and to each other, and no plate less in length than 5 spaces of frames; a reduction in length and size of plating will be allowed toward the hood ends. The edges and butts must be well fitted and water-tight, the butts well supported to receive the plating, and united by straps of the same thickness as the plating, with the fibres of each in the same direction. The frame must have solid filling or lining pieces, closely fitted in one

length of the same breath as frames. In screw-vessels no reduction in plating towards the ends is allowed.

Rivets must be of the best quality of iron, the rivet-holes equally spaced and carefully punched, and to be countersunk through the outer plating. The rivets must be at least their diameter from the edge of plating, lining pieces, or any angle-irons, and distant from each other 4 times their diameter; all edges of horizontal joints of outside plating must be double-riveted throughout.

The main piece of the rudder must be of wrought iron. The ceiling must be of a superior quality, in thickness from 2 to 3 inches, and secured so as to be detached when required.

The decks and water-ways must be equal in thickness to wooden vessels of corresponding tonnage, and fastened with screw-bolts two in each plank, in every beam, the water-ways fastened with screw-bolts, and secured at under side of stringers.

Bulkheads must be made water-tight where ties, stringers, or screw-shafts pass through, closely fitted between two frames at each side, and riveted through them, the whole well supported by angle-irons 30 inches apart, and riveted together and to the floors, beams, and frames, etc. A pump must be fitted to each compartment. Iron vessels are required to have the same equipments as wooden vessels of corresponding tonnage.

Steam-vessels. The classification of steam-vessels depends on the construction of the hull and the character and condition of machinery.

In the construction no departure from the standard rules will be admitted. The scantlings and dimensions must be regulated in proportion to capacity, to insure longitudinal strength. The floor must be filled in solid as high up as the turn of the bilge. The frame must be diagonally iron strapped from the floor-heads to the upper deck beams, and bolted to each timber; and when double laid, riveted in each timber room.

There must be water-tight bulkheads, 30 to 50 feet from stem and stern, to reach at least two feet above deep load-line, which must be well secured to strong stanchions on the after-side. Steam-vessels engaged in the transportation of passengers are required to have sufficient life-boats. Steam-vessels navigating the ocean or coast, are required to have a sufficient spread of canvas to make a port in case of derangement of machinery. All steam-vessels' bottoms are to be examined annually, and are required to be opened for inspection at the expiration of 5 years, to ascertain the condition of their frame.

Sea-going steamers of standard construction, and having sufficient canvas to make port in case the machinery is disabled, rate A 1*.

Sea-going steamers with but little canvas, rate A 1.

Steamers constructed for navigating sounds, lakes, and rivers, rate A 1 to A 2.

Claw Off. To work to windward from a lee shore; particularly when the operation is performed under difficult circumstances.

Clayborne, William. A surveyor by profession. Authorized by the rulers of Virginia to discover the limits of Chesapeake Bay, he pursued his investigation with great ardor between the 34th and 41st degrees of latitude, in 1625. A company having obtained the royal license to trade with the Indians, Clayborne was placed at the head of an expedition, and leaving England with a number of persons disposed to settle in Virginia under his government, he planted a colony on Kent Island, in Chesapeake Bay.

Cleaching Net. A hand-net with a hoop and bar, used by fishermen.

Clean. Free from danger; as, a clean coast, a clean harbor, etc. In general parlance it means quite, entirely.

Clean Bill of Health. See Bill of Health.

Clean Done. Adroitly tricked; purpose well effected.

Clean-full. Rap full; applied to the sails.

Clean off the Reel. When the ship is going so fast as to take the log-line off the reel without its being fed to her, she takes the line *clean off the reel.* The expression is used for anything that is done without stop or hindrance.

Clean Ship. A whale-ship unfortunate in her trip, having no fish nor oil.

Clear. A word applied to many different objects, and its signification is generally opposed to *foul. To clear* a rock, vessel, or point, to get by it without touching. *To clear* a time-glass, to let all the sand run out of one end. *To clear* a rope, to remove any obstruction to its running freely. *To clear* a lighter, to discharge its cargo. *To clear* goods, to pay duties and go through the formalities required by the custom-house officials. *To clear* is to present the proper documents and receive permission of the proper authorities to sail. *To clear* the decks is to send or drive the men off from them. *To clear up* the decks is to lay up the ropes and put everything in its place. The weather *clears up* when the clouds break away, and there is a prospect of a return of fine weather. *To clear away* a rope is to let go the end of it. *To clear for action,* to prepare for battle. *To clear the land,* to gain such a distance from the land as to have plenty of sea-room.

Clearance. A document from the custom-house certifying that the ship has cleared; permission to sail.

Clearing the Distance. The operation of deducing the true from the apparent lunar distance.

Clear Water. Water free from obstructions, as ice, rocks, etc.

Cleat. A piece of wood or metal bolted to the side or deck to which a rope is belayed. *Cleat* is also the name given to a wedge-like piece of wood nailed on a spar to keep the rigging from slipping in or down. *To cleat* an object is to nail cleats against it to keep it from slipping.

Clench. See Clinch.

Clerk. A civilian appointed by the officer who is entitled to his services; as, captain's and paymaster's clerk. He is required to be at least 18 years old, and to serve until regularly discharged. A clerk is a steerage officer, but the captain's clerk sometimes messed with the commanding officer, in which case he was not entitled to quarters in the steerage. The commanding officer is not now entitled to a clerk, his duties being performed by one of the junior officers attached to the vessel.

Cleveland, a port of entry and second city of Ohio, is situated on the south shore of Lake Erie, at the mouth of the Cuyahoga River,

which flows through the city, affording a fine sheltered harbor, to which has been added a commodious ship-channel 200 feet wide, flanked by two piers extending 1200 feet into the lake. A harbor of refuge, commenced in 1878, is also in course of construction by the U. S. government, extending from a point northerly from the west pier, and running west by south to the lake-shore. The work is under the supervision of an army engineer, and is estimated to cost $1,800,000. Lat. 41° 30′ 5″ N.; lon. 81° 42′ 6″ W. Pop. 160,000.

Clew. The combination of nettles by which a hammock is suspended. The ordinary clews are plaited for a short distance below the ring or eye; *Spanish clews* are served without being plaited; triangular spans and iron rings have been used to give spread to hammocks, but they do not give satisfaction. One of the lower corners of a square-sail, or the after lower corner of a fore-and-aft sail. *From clew to earing*, literally, the diagonal of a square-sail; figuratively, from top to bottom; entirely; as, to shift one's clothes from clew to earing. *A clew up*, a case of despair. *To clew down*, to haul on the clew-lines and force a yard down. *To clew up*, to run the clews of a sail up to the yard.

CLEW-CRINGLE. A cringle in the clew of a sail to which the sheet is bent. In our service *clew-irons*, or *spectacle-irons*, are used instead of rope cringles.

CLEW-GARNET. A rope by which the clews of the courses are run up to the lower yards.

CLEW-GARNET BLOCK. A large, single, iron-bound block at the slings of the lower yards, to act as a leader for the clew-garnet. Also the block at the clew of the sail through which the clew-garnet reeves.

CLEW-IRON. The iron shackle in the clew of a sail to which the sheet is bent. The iron is galvanized, and has two eyes with thimbles inserted; the round shape of the iron and the position of the two eyes give it the appearance of a pair of spectacles; hence the name *spectacle-iron*, which is sometimes applied to it. The objection which is sometimes made to the use of clew-irons is that they may iron-mold the canvas. They are stronger than rope and when galvanized do not rust for a long time, and when the sail is worn out they may be galvanized afresh and put in a new sail. They are universally used in the navy.

CLEW-JIGGER. A temporary purchase for hauling up the clews of courses and topsails forward of and above the yard; they are not used at sea. The fore clew-jigger is also used as the inner halliards of the lower stun'sail, and both fore and main clew-jiggers are used as reef-tackles.

CLEW-LINE. A rope by which the clews of all square-sails except courses are run up to their yards.

CLEW-LINE BLOCK. The block at the clew of a topsail through which the clew-line reeves. Formerly, the quarter-block was called a clew-line block.

CLEW-ROPE. The roping at the clew of a sail. A rope leading from the clew of a trysail to the jaws of the gaff.

Click. A small pawl.

Cliff. A precipitous termination of the land. See CRAG.

Clinch. A kind of hitch, in which the end of a rope is taken around the standing part and seized to its own part. In the *inner* clinch the end is inside of the other part, and in the *outer* clinch the end part is outside. The seizings are called *bends*. *To clinch* a rope is to secure the end of it by means of a clinch. *To clinch* a bolt is to rivet the end of it over a ring or plate. *To clinch* a bargain is to settle it beyond further dispute.

CLINCH-BOLT. A bolt, the end of which is turned over by hammering.

CLINCHER. An incontrovertible argument.

CLINCH-NAILS. Nails made of malleable metal, as copper, wrought iron, etc., whose ends may be turned back.

Clinch-built. See CLINKER-BUILT.

Clincher-built. See CLINKER-BUILT.

Clincher-work. See CLINKER-WORK.

Clinker-built. A term to denote that the planks of a boat overlap. When the plates of iron vessels overlap they are distinguished as *lap-jointed*. See CLINKER-WORK.

Clinker-work. Lap-jointed work. A mode of building in which the lower edge of each plank laps over the upper edge of the plank next below. This method of building is employed in boats of light construction, and sometimes in iron ships.

Clinton, George, Admiral. Governor of New York, September, 1743–October, 1753. Died governor of Newfoundland, July 10, 1761. Youngest son of Francis, sixth earl of Lincoln. Appointed commodore and governor of Newfoundland, 1732. Subsequently appointed governor of New York. His want of skill in civil affairs peculiarly exposed him to the tumults and commotions of colonial government. In his controversies with the assembly Colden, afterwards lieutenant-governor, was his champion with the pen; his chief opponent being Horsemander. Clinton afterwards became governor of Greenwich hospital; in 1745 became vice-admiral of the red, and admiral of the fleet in 1757.

Clip-hook. A hook composed of two parts moving on the same pivot. When hooked and moused these two parts form a solid hook, and cannot be separated until the mousing is removed.

Clipper. A long, low, sharp, fast-sailing ship.

CLIPPER-BUILT. Built on the model of a clipper.

Clitz, John M. B., Rear-Admiral U.S.N. Born in New York, March 10, 1823. Appointed from Michigan, August 12, 1837; attached to sloop "Ontario," West India Squadron, 1838–42; Naval School, Philadelphia, 1843.

Promoted to passed midshipman, June 29, 1843; sloop "St. Mary's," Mediterranean Squadron, 1844–45; sloop "Falmouth," Home Squadron, 1845–46; bomb-brig "Hecla," Home Squadron, 1847; capitulation of castle of San Juan d'Ulloa and capture of Tuspan; steamer "Petrita," Home Squadron, 1847–48; frigate "Cumberland," Mediterranean Squadron, 1849–51.

Commissioned as lieutenant, April 6, 1851; Coast Survey, 1851–52; steam-frigate "Mississippi," East India Squadron, 1852–55; special duty, Washington, 1856; sloop "Decatur," Pacific Squadron, 1858–59; steam-sloop "Iroquois," 1861.

Commissioned as commander, July 16, 1862; commanding steamer "Penobscot," North Atlantic Blockading Squadron, 1863; commanding steam-sloop "Juniata," East Gulf Blockading Squadron, 1863; commanding steamer "Osceola," North Atlantic Blockading Squadron, 1864–65; at both attacks on Fort Fisher; navy-yard, Boston, 1866.

Commissioned as captain, July 25, 1866; commanding steam-sloop "Pawnee," South Atlantic Squadron, 1868–69; ordnance duty, navy-yard, New York, 1870; commanding "California" (second-rate), Pacific Fleet, 1870–72.

Commissioned as commodore, December 28, 1872; commanding naval station, Port Royal, S. C., 1876–77; light-house inspector, 1878–80; commissioned as rear-admiral, 1880; under orders to command East India Squadron.

Clive. An old spelling of *cliff.*

Clock, Astronomical. A pendulum clock of superior construction and specially adapted for astronomical observations. It is adjusted to show sidereal time, and indicates $0^h\ 0^m\ 0^s$ when the first point of Aries is on the meridian. It is regulated by observing with a transit instrument the meridian passage of the heavenly bodies. The astronomical clock furnishes the best means of rating a chronometer.

CLOCK, MEAN SOLAR. A clock which indicates *mean solar* or *civil time.* See TIME.

CLOCK, SIDEREAL. A clock which indicates *sidereal* time. See TIME.

CLOCK-STARS. A name for the nautical stars (which see).

Clock-calm. Dead calm; not a breath of air stirring.

Clod-hopper. A clownish landsman.

Close. Near. To draw near.

CLOSE ABOARD. Near the ship.

CLOSE BUTT. A shipwright's definition of a close butt is, a butt of a half-way piece either in the outside planking or the deck of a vessel, not intended to be calked. Before this piece is put into position the seams and the butts of the said half-way pieces are made tight or close for appearance only.

The calker's definition of a close butt is, one that cannot be properly calked without cutting, whereas a proper open butt involves no extra expense, and leaves a smooth edge for the formation of a perfect oakum wedge.

CLOSED PORT. An interdicted or blockaded port.

CLOSE-FIGHTS. See CLOSE-QUARTERS.

CLOSE-FISTED. Stingy; penurious.

CLOSE HARBOR. An artificial harbor with an entrance which may be opened and closed at will.

CLOSE-HAULED. The situation of a ship when her yards are braced up sharp and she is sailing as close to the wind as possible. The after-yards should be braced in a little more than the head-yards, and the upper yards a little more than the one next below, in order that the after-sails may lift before the sails on the fore, and the light sails before the courses and topsails. The helmsman steers by the weather-leech of the upper sail on the main.

CLOSE PACK. See PACK-ICE.

CLOSE PORT. A port which lies up a river, in contradistinction to an *out-port.*

CLOSE-QUARTERS, or CLOSE-FIGHTS. In olden times heavy bulkheads or barricades, fitted with loop-holes, were erected, and the crew retreated to this place when they were unable to drive the enemy's boarders back. The fight was then carried on from inside the barricade. The term, which was then confined to these hand-to-hand combats, is now applied to a fight at short range between ships.

CLOSE-REEF. The last reef in a sail.

CLOSE-SIGHT. The notch in the base-ring of old guns.

CLOSE TO THE WIND. As near the wind as possible without causing the sails to lift.

CLOSE WITH. To approach; as, to close with an enemy.

Cloth. A general term for the sails of a ship. Canvas is wove in *cloths* or breadths, and the width of a sail is denoted by the number of cloths it contains.

CLOTH IN THE WIND. Too near the wind; sails lifting. Also, half intoxicated.

Clothed. The lower masts are said to be *clothed* when the courses have a great deal of *drop.* A ship is *clothed* with canvas when she is carrying all sail.

Clothes-line. A system of parallel lines on which the men's washed clothes are stopped to dry. The harbor-lines extend from the bowsprit to the spanker-boom, and are triced well up to the lower yards. The sea-lines extend from the main to the mizzen rigging.

Clothing. The rigging of the bowsprit. *To clothe* the bowsprit, to rig it.

Cloud. Clouds are masses of visible vapor or watery particles suspended in the atmosphere. A cloud, motionless or nearly so, lying at or near the surface of the earth, receives the name of *haze, mist,* or *fog,* according to its density. The term *scud* is applied to loose vapory fragments of clouds driven by the wind.

The formation and height of clouds vary with the amount of vapor in the air, the course and height of air-currents, the climate, season, temperature, extent of sea and land, and the height of the land. Cloud-strata in mountains vary from 1600 to 3400 feet. Remarkable cloud-rings prevail over the calm zones of the equator, and over those of the tropics of Cancer and Capricorn. Kaemtz regards the usual height of cirrus to be 10,000 to 24,000 feet; cumulus, 3000 to 10,000; nimbus, 1500 to 5000; but cirrus may descend to 2000 or 3000 feet, and nimbus to within a few hundred feet of the earth.

Clouds moderate the sun's rays during the day and the earth's radiation at night; they are the source of moisture required by plants; of the water for springs, lakes, and rivers; and of the polar, glacial, and winter snows.

The scale adopted for indicating the amount of cloud is 0 to 10,—0 denoting a clear sky, 5, a sky half covered, and 10, the sky overcast or wholly obscured.

In 1802, Howard proposed the following classification of clouds, which has been universally adopted: *cirrus, cumulus, stratus, cirro-cumulus, cirro-stratus, cumulo-stratus,* and *cumulo-cirro-stratus,* or *nimbus.*

Cirrus, or curl-cloud, consists of streaks, wisps, and fibres. It is the highest and least dense of clouds; varies most in extent and shape; retains longest its outlines; and is illuminated longest after sunset and before sunrise. Cirrus seems to arise from the mixing of parallel air-currents, or

are the relics of dissolving clouds drawn out by the wind. Cirrus being so high must consist of minute snow-crystals, whose refractions and reflections produce the halos, coronæ, and mock suns and moons almost restricted to this cloud, and its derivatives, the cirro-cumulus and cirro-stratus.

Cumulus, day-, or summer-cloud, consists of dense, convex, hemispherical, or conical heaps of cloud piled or stacked on each other. Cumulus begins after sunrise as a few scattered specks in the clear sky; these specks increase and unite to form clouds, which sometimes cover the whole sky in the afternoon, and generally decrease and vanish about sunset. The tops of these clouds become cirrus in very dry air.

Stratus, fall-, or night-cloud, the lowest of clouds, is a widely extended horizontal sheet of varied thickness. It is common in summer and autumn from sunset to sunrise, and is densest about midnight. After sunrise it generally rises from the ground, breaks up into cumulus, and vanishes with the increasing heat; sometimes it accumulates in layers and becomes nimbus. Stratus does not wet objects which it touches, and thus differs from a variety, cirro-stratus, of like external aspect.

Cirro-cumulus, or sonder-cloud, is composed of well-defined, small, rounded patches, or woolly irregular tufts at great heights. It often has the appearance of flocks of sheep at rest ("sheep in a meadow"), and is commonly known as the "mackerel sky." It may vanish or pass into cirrus or cirro-stratus. It often occurs in warm dry weather.

Cirro-stratus, or vane-cloud, consists of long thin layers with undulated edges. It often assumes a barred appearance, or resembles a shoal of fish. The cloud partakes of the nature of the cirrus and stratus. In distinguishing it, attention must be paid not so much to the form as to the structure, which is dense in the middle and thin towards the edges.

Cumulo-stratus, or twain-cloud, is a cirro-stratus mixed with cumulus heaps, or a wide, flat base surmounted by a bulky cumulus with fleecy protuberances. It is much denser than cumulus, though the air is not dry enough to round off sharply its tops. It often forms vast banks with overhanging masses, and is common towards night in windy weather, when it has a leaden hue. It generally arises from cumulus, and tends towards nimbus.

Nimbus, or cumulo-cirro-stratus, the rain-cloud, is a mixed system of clouds, ending in rain, snow, or hail. It is a dense, continuous, horizontal block, or gray sheet, with fringed edges, a cap of cirrus, and cumulus on the sides and below. Before rain, vast towering masses of cumulus often pass on to cumulo-stratus, which, increasing in density, darkness, and extent, become nimbus capped with cirro-stratus.

In Admiral Fitzroy's system there are four primary classes of clouds, viz.: cirrus, stratus, nimbus, and cumulus. He combines these words to describe the intermediate modifications, and renders the terms more explanatory by the use of the terminations *onus* and *itus;* as, *cirronus, cirritus, cirrono-stratus, cirrito-stratus*, etc. See WEATHER.

CLOUDS, MAGELLANIC. Two nebulæ situated near the south pole.

Clout. A blow. A gore of blood. A chafing-plate on the arm of the axle of a wooden gun-carriage.

CLOUT-NAILS. Nails with which piles and ships' bottoms were studded before the introduction of copper sheathing.

Clove-hitch. Two half hitches, in which the end parts come out parallel with, and opposite to, each other.

Clove-hook. See CLIP-HOOK.

Cloy. To spike (which see).

Club. To drift down a current with an anchor out. Vessels drifting in this manner generally have a spring from the quarter to the ring of the anchor, by which they can be sprung broadside to the current. The objection to this manœuvre is the probability of fouling the anchor.

To club a fleet is to manœuvre so as to place the first division to windward.

Clubbock. The spotted blenny, or gunnel (*Gunellus vulgaris*).

Club-haul. In clawing off a lee shore when there is no room to wear, and therefore an absolute necessity for going about without running the risk of missing stays, the ship is *club-hauled*. The lee anchor is got ready for letting go, and a hawser is bent to it and taken to the lee quarter. Proceed as in tacking; if she goes around, so much the better. If, however, it is evident that she will not go round, let go the anchor when the headway ceases, and brace around the after-yards. When she swings to the anchor the wind will be ahead or perhaps a little on what was the lee bow. Haul in the hawser and make it fast; veer chain, and when the hawser has the strain, slip the cable; when the after-sails fill, brace around the head-yards and cut the hawser. This manœuvre is attempted only when absolutely necessary, as it results in the loss of an anchor, and a part of a cable and hawser.

Clubs, British Service. At every important naval and military station of the British empire are to be found service clubs, whose members are officers on duty at those places, but the leading British service clubs are in London, and we give them according to their date of formation.

The Guards Club, 70 Pall-Mall, was founded in 1813 for the officers of the three regiments of Guards. January 1, 1880, it contained 357 members. The entrance fee is 30 guineas, and the yearly subscription 10 guineas.

The United Service Club, 116 Pall-Mall, was founded in 1815 for senior officers of the army, navy, and marine corps; the limit is major in the army and marines and commander in the navy. January 1, 1880, it contained 1550 members. The entrance fee is £40, and the yearly subscription 7 guineas.

The Junior United Service Club, Charles Street, St. James' Square, was founded in 1827 for officers of all grades in the army, navy, marines, and militia. January 1, 1880, it contained 2000 members. The entrance fee is £40, and the yearly subscription 7 guineas.

The Army and Navy Club, 36 Pall-Mall, was founded in 1838 for officers of the army, navy, and marines of all grades. January 1, 1880, it contained 2342 members. The entrance fee is 40 guineas, and the yearly subscription 10 guineas.

In 1838, Sir Edward Barnes and other officers, just arrived from India, finding that from the lists of candidates for the United Service and

Junior United Service Clubs it would be several years before they could obtain admission, concluded to start an Army Club, and asked the Duke of Wellington to be the president. He declined unless the navy and marines were admitted. That being agreed to it was founded. The Duke of Wellington was the first president. He was succeeded by the Duke of Cambridge. At the death of the latter the present Duke of Cambridge was elected, and is still the president. The club occupied temporary quarters in King Street, St. James' Square, until the present building was completed, in 1854.

The Naval and Military Club, 94 Piccadilly, was founded in 1862 for officers of the army, navy, and marines of all grades. January 1, 1880, it contained 2000 members. The entrance fee is 35 guineas, and the yearly subscription 8 guineas.

The Junior Army and Navy Club, 12 Grafton Street, was founded in 1871 for officers of all grades of the army, navy, and marines. January 1, 1880, it contained 800 members. The entrance fee is 10 guineas, and the yearly subscription 7 guineas.

The Royal Artillery and Engineers' Club, 3 Pall-Mall East, was founded in 1873 for officers of the artillery and engineers. January 1, 1880, it contained 400 members. There is no entrance fee, and the yearly subscription is 3 guineas.

The Junior Naval and Military Club was re-founded in 1879 at 27 Dover Street, Piccadilly, for officers of all grades of the army, navy, marines, and militia. It was established first, in 1875, as a proprietary club on Pall-Mall, but the failure of the proprietor in 1879, and other causes, —the principal one of which was to eliminate objectionable members,—caused it to be re-established at the present address. January 1, 1880, it numbered over 500 members, and no limit was fixed. The entrance fee was *nil*, and the yearly subscription 8 guineas.

The East India United Service Club, 14 St. James' Square, was founded in 1847 for officers of all grades in the East India service, both military and naval. January 1, 1880, it contained 1200 members. The entrance fee is 30 guineas, and the yearly subscription 8 guineas.

The United Service, Junior United Service, and Army and Navy Clubs occupy perfect palaces, which were built especially for them. The Naval and Military occupy the house of the late Lord Palmerston, and their proximity to Hyde Park and outlook on Green Park gives them the finest location in London. They have been recently doing up their club-house, which compares well with the first three mentioned. They have a long lease on the club-house, whereas the other three mentioned own the buildings, and two of them the ground.

The Guards own their club-house, the others lease the buildings. The appointments of all the service clubs in London are first-class. The *cuisine* is the best, the servants who wear the club liveries are attentive, polite, and well trained. Every comfort of a home is to be found in them, and some who live in London merely take lodgings near their clubs, where they spend unoccupied time. The rules and regulations of the service clubs are strict and enforced, yet so framed as to be a protection to the individuality of each member. Socially, they rank at the head of the ninety-odd London clubs, and expulsion from them, as well as other London clubs, means a social disgrace. The number of candidates for admission is always large, and generally five to seven years elapse between proposal and election. In the Army and Navy Club, which always has a large list, as long as twelve years occasionally happens; their average is about eight to ten years.

Military and naval *attachés* of foreign governments, and also the diplomatic corps, are honorary members, while in Great Britain foreign officers can also be elected as such for three months and extension by the club committee, provided they are regularly proposed and seconded. The oldest club in London is White's, founded in 1730. The diplomatic club is the St. James', 106 Piccadilly. The leading social club is the Marlborough, on Pall-Mall. Officers of the army and navy are eligible to election at nearly all the London clubs. Gambling is strictly prohibited at all the London service clubs; for any games the limits of the wager are fixed at a small amount. The experiments of a ladies' and gentlemen's club are tried successfully at the Albemarle, 25 Albemarle Street, and the Russell, 316 Regent Street.

There are no exclusively service clubs in France. French officers in garrison towns generally make one of the *cafés* a resort similar to a club. There is a navy club at Cronstadt, in Russia, and the Guard's Club at St. Petersburg.—*H. T. Stockton, Lieutenant U.S.N.*

Clue. See CLEW.

Clump-block. A short, thick, single block with a metal sheave.

Clutch. A forked stanchion. The oyster-spawn adhering to stones, oyster-shells, etc.

Cluttery Weather. Weather inclined to be stormy.

Co. An abbreviation of *complement;* as, co-latitude, co-sine, etc.

CO-ALTITUDE. The complement of the altitude, or the *zenith distance.*

CO-DECLINATION. The complement of the declination, or the *polar distance.*

Coach, or Couch (*Obs.*). An apartment in a large ship-of-war near the stern was formerly called a "coach." The floor of it was formed by the aftermost part of the quarter-deck, and the roof of it by the poop. It was generally the habitation of the captain.

An apartment before the captain's cabin.

Coach-horses. The picked men who man the barge.

Coach-whip. The narrow pennant.

Coak. To place pieces of hard wood, either circular or square, in the edges or surfaces of any pieces that are to be united, to prevent their working or sliding over each other. A small piece of hard wood or dowel used in coaking.

Coal. A word formerly applied to any substance which was used as fuel. Thus, Sir John Pettus in his "Fodinæ Regales," published in 1660, mentions two kinds of "coale": black, such as is burnt or "charkt"; and white, which is only baked in an oven to make it dry for "fewele." The two substances here mentioned are evidently charcoal and white or uncharred wood, so that with this author "coale" means wood fuel. Mineral fuel, however, has now so long and justly ranked first among fuels that

the word coal has come to be applied to that substance alone.

Coal is found in beds or strata in that group of the secondary rocks which includes the red sandstone and mountain limestone formations, and which is commonly called the *Carboniferous group*, or *coal-measures.* From the peculiarities of their deposition they are often spoken of under the names of *coal-basins* and *coal-fields.* The vegetable origin of coal is evidenced both by its chemical composition, the elements of which, viz., carbon, oxygen, hydrogen, and a small proportion of nitrogen, are precisely analogous to those of all vegetable organic compounds, and by the fact that vegetable tissue is obvious either to the unaided eye or under the microscope in nearly every species of coal formation. There has been considerable difference of opinion as to the mode of deposition of the coal strata, some holding that they have been deposited by the action of water in bringing down drift-wood, others adopting the theory proposed by Dr. Mohr, that they are of marine origin and have been formed by the carbonization of sea-weeds, such as the great kelp plant of the Pacific, while the still more generally received opinion is that they are the result of the transformation of plants on the site of their growth. This latter theory seems to be verified by the fact that all coal strata rest on old soils, and practically consist of nothing but vegetable matter. The abundance of roots shows that the soils supported a luxuriant growth of plants, and these, as they died and fell to the ground, would supply exactly the material for the production of coal. Prominent among the vegetable fossils contained in the "under-clay," or "seat-stones," on which the coal seams rest, are certain long, cylindrical branching bodies called *Stigmaria.* These lie horizontally in the underclay, and their filaments run out in all directions, till the clay is often one thickly matted mass of them. They were long generally accepted as being the roots of a plant called *Sigillaria*, often found fossil in the coal-measures, though Stigmaria had never been found actually attached to Sigillaria. It was reserved for Mr. Binney to supply this missing link in the evidence. He discovered in a railway cutting a number of trunks of Sigillaria standing erect as they grew with roots still attached to them. The roots were Stigmaria, and the rock into which they struck down, which was of course the soil on which the trees grew, was the seat-stone of a thin seam of coal. This discovery seemed to render complete the proof that the herbs and trees of which coal is formed grew on the areas where the coal now occurs. One variety of coal —cannel—forms probably an exception to the general rule here stated. The presence of fossil fish in cannel-coals shows that they must have been formed under water, and they probably consist of vegetable matter which was drifted down into ponds or lakes. They always occur in dish-shaped patches, thinning away to nothing on all sides.

Vegetable matter undergoing decomposition, freely exposed to the action of the air and rain, passes into a dark-brown, moldy substance known to chemists under the name of *Humus* or *Ulmin;* but the process of decomposition does not stop with the formation of humus; the transformation, which mainly consists in the gradual elimination of the oxygen and the concentration of the carbon, still proceeds, and results in the composition of the organic substance of *peat*, which is largely made up of altered humus, generally, although not altogether, derived from the decomposition of the vegetable matter of mosses. Peat varies in external character and chemical composition with its age and position in the beds in which it is found. The upper layer is light in color and soft and spongy in texture, and its vegetable origin is obvious even on the most superficial inspection. Deeper down in the bog the layers become darker and are more strongly pressed together, the vegetable structure becomes less and less apparent, until near the bottom of a deep bog the peat is almost black, has a density nearly equal to that of coal, and requires rather careful scrutiny to detect any organized structure. The chemical composition of the moss alters with this change in outward character; the relative proportion of the oxygen steadily diminishes, whilst that of the carbon as steadily increases. The altered vegetable matter now passes into a form analogous to that met with in *Lignite*,—a dark-brown, somewhat friable substance, of a compact, woody texture. As this woody texture disappears the substance passes into *brown coal*, which contains a still larger percentage of carbon and a smaller percentage of oxygen than the true lignites. From the brown coal we pass by insensible gradations to the black coal, or coal proper. The change is attended by an absolute loss of ligneous structure, by an increased density, and a tolerably well developed cubical fracture. When finely powdered most black coals show more or less of a brown color in proportion corresponding to the amount of oxygen which they contain. The softer varieties of these black coals are usually classed as *bituminous* coals,—a term which is founded on a misapprehension, for there is nothing, strictly speaking, of the nature of bitumen in them. Some coals when thrown on the fire seem to fuse and swell up; these are technically known as *caking* coals, in contradistinction to the dry, or free-burning coals, which retain their shape, but tend to split into columnar fragments. The cause of this difference is not clearly made out. It is certainly not dependent on ultimate composition, for two varieties of coal occurring in the same bed may have the same proportions of elementary constituents and yet behave very differently on heating. Many coals lose their power of caking by long exposure to the air; but, on the other hand, the slack of non-caking coal may often be made to fuse together into a compact mass if heated suddenly.

The blacker and harder varieties of coal gradually merge into the kind known as *stone* coal, or *anthracite.* Anthracite has a brilliant lustre; is denser, harder, and more brittle than ordinary bituminous coal, and has a conchoidal fracture. It ignites with difficulty, and gives out little flame on burning, owing to the non-formation of volatile hydrocarbons. The manner in which anthracite has been formed has given rise to much discussion. The general opinion is that it is simply bituminous coal modified or altered by heat. The evidence on this point is, however, far from being conclusive. Many coals tend to become anthracitic by simple exposure to air at ordinary temperatures. It has also been observed

that coal in the vicinity of open faults, or immediately below a sandstone roof, alters in texture, loses its cubical fracture, and is more highly carbonaceous than the ordinary bituminous varieties. Hence it must not be supposed that anthracite is necessarily the oldest because it is the most altered form of coal. There are coal-basins in which the coal is of the same age throughout, while in one part it is of the ordinary bituminous kind and in another part anthracite.

The essential conditions for the formation of the coal strata would seem to have been:

1. A luxuriant vegetable growth on the site of deposition.

2. A gradual subsidence of the area covered with the vegetable deposit beneath a shallow sea, during which beds of sediment—sand or clay—were deposited on top of it.

3. A re-elevation of the submerged area, and a repetition of the processes of growth, deposition, subsidence, sedimentary deposits, and emergence.

We have no means of knowing, even approximately, what amount of woody fibre would be required to make coal. Mohr has calculated that the transformation is attended with a loss of 75 per cent. in weight, and that when regard is had to the density of the two substances, the volume of the coal is only about one-twelfth of the woody matter from which it has been derived, but the data for such computations are not very trustworthy.

Attempts have been made by Cagniard de la Tour, Rivière, Daubrée, and others to imitate by heat the mode in which coal has been produced from wood. According to Baroulier, vegetable matter, such as sawdust, twigs, stalks, and leaves, imbedded in moist clay and heated from 200° to 300° C. for some time, yields a carbonized mass very similar to some varieties of coal.

Let us now briefly glance at coal as a source of power. The foot-pound, by which is meant the amount of work necessary to raise a pound in weight through a foot of space, may be taken as a convenient unit by which to measure the energy of heat in the production of power. The brilliant researches of Joule, Weber, and others inform us that (in round numbers) 772 foot-pounds of work are necessary to produce a unit of heat, and conversely, that a unit of heat, if entirely used up in the production of mechanical work, will perform 772 foot-pounds. From various experiments made on the calorific power of coal, it has been deduced that a pound of good coal in the state in which it is ordinarily used gives out during combustion about 14,000 units of heat. By multiplying the number of units of heat produced by the combustion of a pound of coal by 772 we obtain the number of foot-pounds of work to which the heat is equivalent. By this rule the average mechanical value of a pound of coal is $14,000 \times 772 = 10,808,000$ foot-pounds,—in round numbers 10,000,000 foot-pounds. The following table gives the number of foot-pounds of work which can be done under favorable conditions by a man and a horse, together with the number of pounds of coal the combustion of which would produce the same amount of work. The result is that a man and a horse, under the most favorable circumstances referred to in the table, could only do in a day as much work as is locked up in two-tenths and twelve-tenths of a pound of coal respectively.

Kind of Work.	Foot-pounds of work per day.	Number of pounds of coal the heat of combustion of which is equivalent to work.
Agent, Man.		
Raising his own weight up stair or ladder	2,088,000	0.21
Carrying weights up-stairs and returning unloaded	399,600	0.04
Pushing or pulling horizontally	1,526,400	0.15
Working pump	1,188,000	0.12
Agent, Horse.		
Drawing cart or boat (walking)	12,441,600	1.24
Drawing light railway truck (cantering and trotting)	6,444,000	0.64

It must be remembered, however, that only a small proportion of the total heat supplied by the combustion of the coal is employed in the production of useful work. The loss of the remainder is due to several causes, which, although theoretically preventable, will probably never be completely done away with. Some of them, such as imperfect combustion, conduction, and radiation, may, by careful firing and improved construction of furnaces, be rendered very small, but as things are the net result is that only from 50 to 70 per cent. of heat is transmitted to the water and steam, and that of this a small fraction, amounting in the best engines to only about 11 per cent., is converted into work. The enormous loss of power which thus occurs in the steam-engine has from time to time prompted efforts to devise other forms of machines, which, while equally serviceable for practical purposes, shall more efficiently utilize the heat of the fuel employed. The electric-engine, the air-engine, and the gas-engine are among the results of the efforts thus inspired. Coal is the source of power in them all, though the machinery for transforming its energy into useful work is widely different. In the steam- and air engines it is employed directly; from it the gas required for the gas-engine is extracted, and by it the zinc or other metals used in the galvanic cell are smelted. The subjoined table gives, in the second column, the percentage of heat which the various machines named transform into work under favorable conditions, and in the third, the relative cost of the fuel capable of producing equal quantities of work in each.

	Percentage of heat utilized.	Relative cost of fuel for equal quantities of work.
Electric-engine	50	55.00
Air-engine	13	0.84
Steam-engine	11	1.00
Gas-engine	10	6.00

The electric-engine and the gas-engine are convenient, both because they can be set in motion without delay and because the expenses connected with them are incurred only when they are actually working. They are compact in form, and are well suited for operations in which

a small amount of power at irregular intervals only is needed. The cost of the fuel is, however, in both cases too great to admit of their employment on a large scale. The air-engine, on the other hand, though making a better use than the steam-engine of the fuel with which it is supplied, is discarded on account of its bulk, and because the hot air oxidizes, and so destroys the metallic surfaces with which it is in contact.

In respect of their steam-producing qualities, the different varieties of coal possess merits and defects the importance of which can be estimated only by reference to the special purpose in view. Recent experiments carefully made by a board of chief engineers of the navy with anthracite and certain typical varieties of bituminous and semi-bituminous coals, afford the following data for a comparison of the vaporization efficiencies of the kinds of coal named:

than any other coal, and more men are required to produce a given weight of steam in a given time with it than are required with any of the coals likely to be placed in competition with it. But its supreme defect is its excessive slowness of combustion, in which respect it is inferior to any other coal, requiring a correspondingly larger boiler to produce a given weight of steam in a given time. For a naval steamer, where space is the most difficult thing to obtain, this defect is most serious, requiring a longer vessel to hold the greater quantity of boiler for a given speed; or, if this additional length be not given, then obtaining the speed at the expense of other valuable qualities of the vessel.

The semi-bituminous coals of Maryland and Southern Pennsylvania, which are the analogues of the steam-coals of Southern Wales, have merits and defects less strongly marked than the

Kind of Coal.	Rate of Combustion.	Rate of combustion per hour per square foot of grate-surface.		Pounds of water vaporized from the temperature of 212 degrees Fahrenheit, and under the standard atmospheric pressure.			Pounds of steam produced per hour.	Weight of the coals.		
		Pounds of the crude coal.	Pounds of the gasifiable portion of the coal.	Per pound of crude coal.	Per pound of the gasifiable portion of the coal.	Per cubic foot of the crude coal.		Per centum of the coal in refuse of ash, clinker, and soot.	Weight of the coal in pounds per cubic foot.	Cubic feet of space required to stow one ton of coal.
Bituminous	Slow	7.9896	7.4809	10.9595	11.7047	534.2756	2626 86	6.3670	48.75	45.9487
	Medium	13.0334	12.2036	10.2023	10.8960	497.3621	3989.14	6.3670	48.75	45.9487
	Maximum	14.3664	13.4517	10.1386	10.8280	494.2567	4369.67	6.3670	48.75	45.9487
Semi-bituminous	Slow	7.8199	6.858	10.3361	11.7858	558.1494	2424.93	12.3005	54.00	41.4815
	Medium	11.6340	10.203	9.9357	11.3292	536.5278	3467.69	12 3005	54.00	41.4815
	Maximum	13 9875	12.267	9.6912	11.0505	523 3248	4066.80	12.3005	54.00	41.4815
Anthracite	Slow	7.7905	6.611	9.9923	11.7751	559.5688	2335.36	15.1402	56.00	40.0000
	Medium	10.5798	8.978	9.9923	11.7751	559.5688	3171.50	15.1402	56.00	40.0000
	Maximum	12.9531	10.992	9.9923	11.7751	559.5688	3882.96	15.1402	56.00	40.0000

The merits of the anthracite as a steam-producer on board of vessels are very considerable. It gives a high economic vaporization, which is less affected by forcing the rate of combustion than in the case of other coals. It has a greater density than other coals, whereby a greater weight can be stowed in the same space; this is a very important merit for all vessels, and in an especial degree for naval vessels, where the space allowed for coal is necessarily more restricted, and where the need of carrying a long supply is greater than in merchant vessels. It possesses such strong cohesion that it is always furnished in lumps, and it suffers scarcely any waste by transportation or handling; but the same quality entails more labor in breaking it on the fire-room floor to suitable lumps for firing.

Anthracite is scarcely affected by weather or water, it emits no smoke, deposits but little soot, and is in no danger of spontaneous combustion, —all very important merits for steamers, and particularly for naval steamers. The absence of smoke is of the highest value to naval steamers in time of war, the presence of smoke betraying their position at long distances.

A great defect of anthracite is its large per centum of refuse, a considerable part of which is strongly adherent clinker, entailing great labor on the firemen. In this respect it is worse

anthracite. Their economic vaporization is sensibly the same as that of anthracite, but their density is less, causing a greater space to be required for the stowage of a ton. They are more injured by weather and water, and occasionally suffer spontaneous combustion, but very favorable conditions are necessary to produce it. Being very friable, they make a great deal of dust, and the loss in handling from this cause is greater than with anthracite. They emit a moderate quantity of light-brown smoke, and deposit a moderate amount of soot on the heating surfaces of the boiler. They give a less per centum of refuse than anthracite, and of that refuse a less proportion is clinker. In firing a given weight of coal the labor is much less with the semi-bituminous than with the anthracite. As steam-producers the semi-bituminous coals have a marked superiority over the anthracite in their much greater rate of combustion, a merit of the highest value for all steamers, and in an especial degree for naval steamers, allowing, with a given quantity of boiler, a greater speed of vessel than is possible with anthracite. In the case, however, of a forced combustion by steam-jets or blowers, the economic vaporization of the semi-bituminous coal would be less than that of the anthracite.

The bituminous coal gives off somewhat more

smoke than the semi-bituminous coal, and deposits correspondingly more soot on the heating-surfaces of the boiler. It has less density and requires more space to stow a given weight, but is about as friable, has about the same proportion of dust, and wastes about as much in handling and in transportation. Its economic vaporization is higher than that of either the semi-bituminous coal or of anthracite at all rates of combustion, due to its less per centum of refuse, for the economic vaporization of its gasifiable portion is less than that of the gasifiable portion of those coals. Its rate of combustion is higher than that of the semi-bituminous coal, and considerably higher than that of anthracite. Its per centum of refuse is greatly less, and a given weight of it can be fired with much less labor than in the case of either anthracite or semi-bituminous coal. As regards smoke, soot, dust, and spontaneous combustion, it is no more objectionable than the best of other coals, exclusive of anthracite, while it exceeds all in economic vaporization, rate of combustion, and ease of firing. Its great defect for use on shipboard is its low density, nearly one-seventh more space being required to stow equal weights than with anthracite, and nearly one-ninth more than with semi-bituminous coal. But if the comparison be made for the bulks required to produce equal quantities of steam, then the bituminous coal requires about one-eighth more space than anthracite and about one-tenth more space than semi-bituminous coal.

COAL-HEAVER. One employed in handling coal in loading and unloading, or in bringing it to a furnace in such quantities and at such times as may be required. In steamships the coal-heaver must break the coal to a proper size, remove all ashes and refuse, sweep boiler-flues or tubes, and assist in handling the fires and cleaning the machinery. Intelligent men acquire the art of "fireman" or "stoker" in a short time. On board vessels of war, at "general quarters," such coal-heavers as are not actually employed in serving the furnaces are attached to the powder division; and when the ship is under sail, without steam, they are placed in the deck-watches.

COAL-TAR. Tar extracted from bituminous coal.

Coal-fish. The *Gadus carbonarius.* Called *gerrack* in its first year, *cuth* or *queth* in its second, *sayth* in its third, *lythe* in its fourth, and *colmie* in its fifth, when it is full grown.

Coal-sacks. An early name of dark patches of sky in the Milky Way, nearly void of stars visible to the naked eye. The largest patch is near the Southern Cross, and called the Black Magellanic Cloud.

Coal-say. The coal-fish.

Coamings. The pieces that lie fore and aft in the framing of the hatchways and scuttles. The pieces that lie athwart ship, to form the ends, are called *head-ledges.*

Coast. The sea-shore; the sea-front of the land.

COASTER. A small vessel engaged in coasting.

COASTING. Sailing along the coast, for which is necessary a minute knowledge of the tides, currents, prevailing winds, rocks, shoals, harbors, landmarks, etc. The position of the ship is determined by the lead and by bearings.

COASTING TRADE. The commerce between two ports of the same realm or state. See COMMERCE.

COAST-PILOT. A pilot licensed to conduct vessels from one part of the coast to another. On going into port he is superseded by the local pilot.

COAST-WARNING. A storm-signal on the coast.

COASTWISE. By way of or along the coast.

Coast and Geodetic Survey. The scope of the United States Coast and Geodetic Survey embraces, 1, a *geodetic* survey of the whole area of the United States; 2, a *topographical* survey of the lands bordering the sea-coast and the rivers to the head of ship navigation, "to be carried as far inland as may be necessary for purposes either of commerce or defense" (Plan of the Survey); and, 3, the *hydrography* of the waters adjacent to the coast, Lake Champlain, the bays, harbors, and navigable rivers to the head of ship navigation, and including the Gulf Stream, its approaches, and extension.

GEODESY.—The geodetic work comprises a system of triangles, starting from a measured base and spreading over large areas, controlled in direction with reference to the meridian by astronomical *azimuths.* Three orders of triangulation are recognized on the work, viz., the *primary*, with sides varying in length from 20 to 169 miles; the *secondary*, with sides of from 5 to 40 miles; and the *tertiary*, with sides of less than 6 miles.*

The primary and part of the secondary series, composed principally of quadrilaterals, and verified at intervals by the measurement of additional bases, and by new determinations of the astronomical azimuth, latitude, and longitude, constitute the standard geodesy of the survey. From this class of work, in connection with pendulum observations for the determination of gravity, the dimensions and figure of the earth are deduced. Measurements of arcs of the meridian and of the 39th parallel of latitude are now (1880) in progress. Part of the secondary triangulation is used to connect the primary with the tertiary. The primary bases are measured with compensated bars or rods, designed by the late Prof. A. D. Bache, by whom the imperfections in the base apparatus previously in use were almost entirely eliminated. An apparatus is about to be constructed, upon the design of Assistant C. A. Schott, on the principle of the *Borda thermometer.* It will consist of two rods protected by wooden cases, very light and portable. Each rod will be provided with two compensations, by one of which the length is kept constant through all changes of temperature, whether sudden or gradual, and by the other the rear end is kept in place when the rod is set in its trestles. Like those now in use, the new rod will be provided with the level-sector for measuring inclinations. The forward end of each rod will be provided with an agate face, and the rear end with the *sliding-contact attachment*, terminating in an agate knife-edge, set horizontally.

The *angular measurements* are made with theodolites of the most perfect character known to the present state of science. In the *astronom-*

* Field Work of the Triangulation, by Gen. R. D. Cutts, Assistant.

ical work the transit instrument for time observations and the *zenith-telescope* for latitudes are used. The magnetic telegraph is used for measuring differences of longitude, measurements being made from station to station around a circuit, observers exchanging positions between stations, and finally returning to the initial point as a test of the accuracy of the work. Early advantage was taken of the transatlantic cables by the Superintendent of the coast survey to connect the principal observatories of Europe with those of the United States, assistants being sent abroad for that purpose.

Geodetic-leveling.—In order that all distances may be reduced to the level of the sea, the heights of primary points are measured by leveling instruments of the most refined character, and by methods which secure the utmost precision. Owing to local needs, the geodetic work has been begun independently in several parts of the country; the junction of these partial systems offers a crucial test of the accuracy of the work. Only selected observers of long training and great skill are employed on this portion of the survey. Trigonometric surveys are being carried on in several of the States by the Coast and Geodetic Survey in connection with the geodetic work; under instructions from the Superintendent the work is executed by college professors during their vacations, subject to the supervision of the chief of the geodetic division.

TOPOGRAPHY.—By the *tertiary triangulation*, based upon the secondary, are located points for the use of the topographers and hydrographers; being an essential part of the topography, it covers practically the same ground as the latter, as above described. Every triangulation point is permanently marked, and a sketch and description of the locality taken, with the bearings and distances of *witness-marks*, placed for the purpose if necessary, so that the point may be recovered when needed. The latitude and longitude of each triangulation point are computed, and its distance and azimuth from at least two other points.

Projections.—In all the original or manuscript maps and charts of the Coast and Geodetic Survey, as well as in the published series, the *polyconic projection* is used for representing the surface of the earth upon a plane, this projection exhibiting areas with the minimum of distortion, and showing distances in all parts of the sheet to the same scale. The projection is drawn upon the sheet before it is taken into the field. The parallels and meridians are drawn usually for each minute of latitude and longitude respectively. All triangulation points determined, falling within its limits, are plotted upon the sheet. The *plane-table* is the instrument used in the topographical survey. By this instrument all topographical features are represented upon the sheet in their true position (*i.e.*, in bearing and distance), relative to the already established points, and are drawn to scale. Cultivated fields, woodlands, grass, salt- and fresh-water marshes, hill and plain, sand-beaches, reefs, and other topographical features, whether natural or artificial, are represented, each with its appropriate conventional symbol. In order to avail himself of the triangulation points the topographer erects signals over them, unless, as often happens, they are located upon some conspicuous object, which itself answers for a signal. The scales of original topographical sheets vary from 1-20,000 of nature, the smallest scale, to 1-1200, the largest; those most frequently used are 1-20,000 and 1-10,000, or, approximately, $3\frac{6}{10}$ inches to the geographical mile, and $7\frac{2}{10}$ inches. The topographer locates the shore-line to low-water mark, and fixes the position of all islands, reefs, and rocks which are visible at low water. Elevations are represented by drawing the contours of different heights, usually for every 10 or every 20 feet above the *datum-plane*.

HYDROGRAPHY.—There are three classes of hydrography, differing mainly as to their results in the number of soundings in a given area: they are, 1, *harbor and river* work; 2, *inshore-soundings* along the coast; and, 3, *deep-sea soundings*. The first two are intended, *first*, for the development of fair-ways and anchorages, of shoals, bars, reefs, and other obstructions to navigation; and, *second*, to show the changes which from time to time take place. The harbor and river work is close enough for ordinary constructive works, though special surveys are usually made for that purpose. The area to be surveyed having been determined by the Superintendent, a *projection* covering the same is furnished to the hydrographer; all triangulation points which fall within its limits are plotted on the sheet, together with the shore-line, and any topographical objects or features, natural or artificial, which may assist him in his work. Copies of the *sketches and descriptions* of triangulation points above referred to are furnished him to enable him to find them the more readily. Having selected and recovered such points as he needs, he erects "hydrographic signals" over them (fixing new points for himself if needed), establishes his *tide-gauge*, and is then ready to begin his soundings. It is usual to run the soundings in parallel lines, with a second system of lines crossing the first at right angles; the number of lines and of soundings upon each line depend upon local conditions and needs. The time, depth, and character of the bottom are noted at each sounding. The position of the vessel or boat is fixed from time to time, either by simultaneous *cuts* from two theodolite stations on shore, or by measuring from the boat with a sextant, the angle between a selected central signal and one on either side of it respectively, or, as it is usually known, by the "three-point problem." In the deep-sea work the positions are determined astronomically. Other systems of lines in addition to the above are used for special purposes, such as the development of bars, shoals, intricate channels, etc. The soundings before being plotted are (in the harbor and inshore work) reduced to the plane of *mean low* water, or, on the Pacific coast, to that of *lower-low* waters. The curves of equal depths are drawn to correspond with the contours of equal elevation on shore. The work of the hydrographer extends to *high-water* mark, thus lapping that of the topographer. *Tidal observations* are carried on to give data for the reduction of soundings, for the computation of the *tidal establishment*, and for computing *tide-tables* in advance; in the last are predicted the times and heights (above or below the usual plane of reference) of the high and low waters at the stated parts for every day in the year. In many

localities continuous tidal observations, covering a complete lunar cycle,—nineteen years,—have been made, or are in progress.

Deep-sea Hydrography.—Under this head are being investigated the depths, currents, surface and sub-surface, the temperatures and densities of the sea-water from surface to bottom. Specimens of the water and of the bottom are being obtained for examination and analysis, and deep-sea dredgings of the most successful character are being carried on. For all soundings of over 100 fathoms wire is used, with the very perfect apparatus designed by Lieutenant-Commander C. D. Sigsbee, U.S.N., Assistant Coast and Geodetic Survey. Much of the deep-sea work is designed for the study of the origin, extent, phenomena, and influences of the *Gulf Stream.*

Physical Hydrography.—Under this head are investigated, either by special observations or by those taken in connection with other work, the *tidal circulation* and movements, the flow of rivers, the action of the waves, and the effect of each and of all combined in producing changes in harbors and upon the coasts; the effects, in conjunction with these, of artificial works, whether protective, such as breakwaters and jetties; for improvements, such as the deepening of channels and fair-ways; or economical, such as wharves, etc.; or for the reclaiming of overflowed lands, and, by analogy, the probable effects of any such works when in contemplation.

Coast-pilot.—The work of this division consists in preparing descriptions and views of the coasts, particularly the approaches to ports, harbors of refuge, etc., the description of the dangers to navigation, of the established artificial aids to navigation, and of sailing directions for navigating the coast, and for entering and leaving the ports and harbors.

Magnetic Work.—Observations are in continuous progress, at fixed magnetic observatories, and by parties moving from place to place on land and at sea, for declination and the other magnetic elements. The results are used for the preparation and correction of the *isogonic charts*, for keeping the variation of compass correctly noted upon the marine charts, and for recording the secular changes in the variation. It is hoped that sufficient data will ultimately be obtained to determine the law of the secular change, and to make it possible to predict it for many years in advance.

Instructions.—The work of each party in the field is executed under written instructions issued by the Superintendent.

Office Work.—All *original sheets and field-notes* are carefully preserved, and sent to the office at Washington, where, under the immediate direction of the assistant-in-charge of office, the computations and reductions are examined and checked, or made independently by a corps of trained computers. Plotting done in the field is carefully inspected, and, if need be, replotted from the original notes. *Drawings* for charts are made by one set of draughtsmen reducing the work from the original sheets to the publication scale, after which the reductions are verified by other draughtsmen. The charts thus prepared are engraved upon copper plates, from which, after careful examination, electrotype plates are made for the plate-printer, no printing being done from the engraved plate. The work passes through many hands and processes, by which a constant check is kept upon its accuracy, and at each stage it is examined, and must be approved by the Superintendent.

Publications.—The regular publications of the Coast and Geodetic Survey consist of Marine Charts, Magnetic Charts, the Coast-pilot, the Superintendent's Annual Report of Progress, the Tide-tables of the Atlantic and Pacific Coasts, and the series entitled "Methods, Discussions, and Results," in which last, as the name implies, are described the plan of the survey, the methods, instruments, and appliances used, and the results expected and required. The most of these are scientific papers of great value. The *occasional publications*, usually contained in the appendix to the Annual Report, are scientific papers, which do not fall under the last-named head. The *Charts* are in four series, viz.: 1, *sailing charts*, on a scale of 1-1,200,000; 2, *general coast charts*, on a scale of 1-400,000; 3, *coast charts*, on a scale of 1-80,000; and, 4, *harbor charts*, on larger scales.

Organization.—The *personnel* of the Coast and Geodetic Survey comprises a superintendent, in general charge of the work, with a corps of assistants, sub-assistants, aids, and recorders for field service; of computers, tidal computers, draughtsmen, engravers, electricians, mechanicians, and plate-printers for office work; a disbursing agent and accountant; a secretary, and copyists. By authority of law, officers and men of the navy are employed upon the hydrographic work of the survey. There have been thus far four superintendents, viz., Ferdinand R. Hassler, from the first organization of the work to 1843; A. Dallas Bache, LL.D., from 1843 to 1867; Benjamin Peirce, LL.D., from 1867 to 1874; and Carlisle P. Patterson, C.E., LL.D., since 1874.

Weights and Measures.—The superintendent of the Coast and Geodetic Survey is also superintendent of the standard weights and measures of the United States.—*Edward P. Lull, Commander U.S.N.*

Coast-Guard of Great Britain, The, originally instituted as a means of revenue protection, has taken, on account of the free-trade policy of Great Britain, which exempts almost all articles from duty except spirits and tobacco, the character of a naval reserve and a life-saving and signal service. It employs 4000 officers and men ashore; afloat, there are 9 large ships (iron-clads) and 40 small vessels, the latter used as cruising and watch vessels, and varying from 100 to 500 tons each. The first named form the squadron of the first reserve; one is attached to each coast-guard district, and is commanded by the captain commanding the district; they are all under reduced complements.

The whole coast is divided into 9 districts, termed the Hull, Harwich, Newhaven, Weymouth, Liverpool, Leith, Clyde, Limerick, and Kingstown districts. The districts are subdivided into 79 divisions, in charge of inspecting officers, of whom, at present writing (May, 1880), 36 are commanders, 32 lieutenants, and the remainder subordinate coast-guard officers. The divisions are again divided into 225 stations, each in charge of a chief officer, who is about equal in rank to a warrant-officer. The whole is under

the command of an admiral superintendent, whose principal office is in London.

At each station are erected neat groups of cottages for the men, in which they may live with their families. The coast lying between the stations is patrolled at all times, and means of signaling from point to point are at hand. During the summer months all the force that can be spared is embarked in the 9 coast-guard ships, which then cruise in squadron for 6 weeks, generally as part of the Channel squadron. The men are thus kept in a high state of efficiency as regards drill and seamanship.

The qualifications for entry into the coast-guard are as follows: Every seaman in the navy of good character, who has completed 8 years' continuous service, whose age does not exceed 37, who is either a trained man or a seaman gunner, and who wears at least one good conduct badge, is, upon the recommendation of his captain, eligible. There is no restriction as to the number of candidates to be recommended from any particular ship.

All men are discharged from the coast-guard at 50, whether fit for service or not, excepting chief boatmen in charge, who are discharged at 55. On leaving they are under the same rules as regards pensions as the other men of the navy.

Men who enter the coast-guard must renew their continuous-service engagements while serving in that force; they may also be discharged into a sea-going ship for misconduct, or at their own request.

This unequaled body of men forms England's most efficient and valuable reserve in time of war, there being enough men employed to furnish the men of the seamen class for a squadron of 15 large ships.

The estimates of 1880 for the men of the coast-guard are £50,781. The total charge of the coast-guard service, including officers and men of the ships and vessels employed, provisions, stores, buildings, etc., including the above £50,781, is £454,414.—*F. E. Chadwick, Lieutenant-Commander U.S.N.*

Coat. A piece of canvas fitted around the partners of the masts to prevent the water from getting below. A layer of paint, varnish, shellac, etc.

COAT-TACKS. The peculiar nails with which mast-coats are fastened.

Coat of Mail. The chiton shell.

Cob. To punish by striking on the breech with a strap or cobbing-board. A young herring. A sea-gull. A breakwater or dock made of piles and timber and filled in with rocks.

Cobb. A Gibraltar term for a Spanish dollar.

Cobbo. The small fish known as the miller's thumb.

Coble, or Cobble. A low flat-floored boat used in the cod- and turbot-fisheries; the rudder extends 4 or 5 feet under the bottom. There is also a small boat of the same name used by salmon-fishers.

Coboose. See CABOOSE.

Cock. A device for regulating or stopping the flow of fluids through small pipes. It consists principally of a conical "plug," accurately fitted to a "shell" or "chamber," with its axis at right angles to that of the pipe to which it is attached, the plug being penetrated by a hole equal in area to that of the pipe. When the plug is turned on its axis the opening may be increased or diminished at will, or closed altogether. The shell is provided with flanges or screw-nipples for attaching it to the pipe, and the plug with a handle. When a cock is used for drawing liquids from a reservoir it is frequently called a "faucet" or "spigot." The hammer of a gun-lock. *To cock* a piece is to raise the hammer to its full extent.

Cockade. A knot of ribbons or rosette worn on the hat as a badge.

Cock-a-hoop. Full of confidence and high spirits.

Cockandy. A name for the puffin, otherwise called *Tom Noddy* (*Fratercula arctica*).

Cock-bill. *To cock-bill* the anchor is to suspend it from the cat-head preparatory to letting go. *To cock-bill* the yards is to top them up at an angle with the deck,—the symbol of mourning.

Cock-boat. A very small boat used on rivers or near the shore.

Cockburn, Sir George, Admiral. Serving the crown of Great Britain from his youth, this officer as he advanced in rank manifested a capacity for responsible command. During the long war with revolutionary France and the Empire he captured the island of Martinique. At a later period, when peace had been made with France and a war begun with the United States, Cockburn was sent to America, and numbered among his exploits the destruction of some of the buildings in Washington and on the shores of the Chesapeake and Potomac. Finally he was intrusted with the duty of conveying Napoleon I. and his suite to their prison on the island of St. Helena.

Cocked Hat. The full-dress head-covering of naval officers. See UNIFORM.

Cocket (*Eng.*). A cock-boat. A custom-house seal. An instrument sealed and delivered by officers of the customs as a warrant that merchandise is entered. An office in the custom-house where goods to be exported are entered.

Cocket-bread. Hard sea-biscuit.

Cockle. A common bivalve mollusk (*Cardium edule*), often used as food.

Cockling Sea. Tumbling waves dashing against each other with a short and quick motion.

Cock-paddle. A name of the paddle, or lump-fish (*Cyclopterus lumpus*).

Cockpit. An apartment below the water-line, in which the wounded are placed during an engagement. The rooms are used as store-rooms and for quarters for such officers as cannot be accommodated in the steerage. In olden times the warrant-officers were quartered in the fore cockpit, and subsequently under the forecastle; hence the name *forward-officers*.

COCKPITARIAN. A name for one who was quartered in the cockpit.

Cocksetus. An old law-term for a boatman or coxswain.

Cocksure. Dead certain.

Cockswain. See COXSWAIN.

Cocoanut-tree. The *Palma cocos* yields *toddy*; the nut a valuable oil and milky juice; the stem, bark, branches, etc., also serve numerous purposes.

Cod. The centre of a deep bay. The bight of a trawl or seine. Also, the *Gadus morrhua*, one of the most important of oceanic fishes. The

ccd is always found on the submerged hills known as banks; as, the Dogger Bank and banks of Newfoundland. *To cod*, to rig; to harass; to tantalize.

COD-BAIT. The large sea-worm, or lug, dug from the wet sands; the squid or cuttle, herrings, caplin, any meat, or even a false fish of bright tin or pewter.

COD-FISH. See COD.

COD-FISHER. A banker, or fishing-vessel, which anchors in 60 or 70 fathoms, and remains fishing until full, or driven off by stress of weather. Season from June until October. See FISHERIES.

COD-LINE. An eighteen-thread line.

COD-SOUNDS. The swim-bladders of cod-fish, cured and packed for the market.

Coddy-moddy. A gull in its first year's plumage.

Code. See SIGNALS.

Codrington, Sir Edward, Admiral. In 1827, when the Greeks were resisting Turkish oppression, a combined French, Russian, and English fleet was dispatched to the Mediterranean to stop the cruelties practiced by Ibrahim Pacha, who was then in command of an Egyptian fleet. Sir Edward Codrington commanded the British squadron. Entering the harbor of Navarino, he commenced negotiations with the pacha, with the view of putting an end to the barbarities of the Turks. A reference to Constantinople being deemed necessary before any compact could be concluded, it was arranged that the pacha's fleet should remain in the harbor until the sultan's reply was received, and in the meanwhile the European fleets retired; but they had scarcely left Navarino when the Turks violated the armistice and attempted to sail out of the harbor. Codrington forced them back. A fierce battle ensued, and the Turkish fleet of 81 men-of-war was destroyed, only 1 frigate and 15 smaller vessels being left in a condition to put to sea again.

Coehorn. A small mortar, usually of bronze, throwing a shell of from 12 to 24 pounds, and convenient for ships' gangways, launches, etc., afloat; and for advanced trenches, the attack of stockades, etc., ashore. It takes its name from its inventor, Baron van Coehorn, a celebrated Dutch engineer and general of the latter part of the 17th and early part of the 18th centuries.

Coffer-dam. A device employed in hydraulic engineering to lay bare a portion of the submerged surface. It consists of a water-tight inclosure, formed by double lines of piles filled in with clay tightly rammed. It may also be made with piles only, the piles being driven close together, and sometimes notched or dovetailed into one another; or, if the water is not very deep, the piles may be driven at a distance of five or six feet from each other and grooved in the sides, with boards let down between them in the grooves. However formed, it must be made very strong and well braced from the inside to resist the pressure of the water from without. The water inclosed within the dam is gotten rid of by being pumped out.

Cog. The tooth of a wheel, by which motion is communicated to another wheel. A coak or dowel.

Cogge. An Anglo-Saxon word for a cockboat or light yawl.

COGGE-WARE. Goods carried in a cogge.

Coggle, or Cog. A small fishing-boat.

Cogmen. Shipwrecked mariners who wander about begging and stealing; nautical tramps.

Coguing the Nose. Making comfortable over hot grog.

Coign. See QUOIN.

Coil. A quantity of rope wound into a ring or series of rings; each turn of the rope is a *fake*, and several of these fakes, one within the other, are called a *sheave* or *tier*. In a *Flemish coil* there is but one sheave, the hauling part being in the centre.

Coir. The fibrous husks of the cocoa-nut, used for making ropes, mats, brushes, brooms, etc. Coir cables have the advantage of floating on the water, but they are disagreeable to handle.

Coke. The charcoal obtained by heating coal with the imperfect access of air, or by its distillation. The former is usually called *oven coke;* the latter *gas coke*, being abundantly produced in gas-works. Caking coal (for which see COAL) is most suitable for the manufacture of coke. As the coal becomes heated it evolves a number of substances, solids, liquids, and gases, and yields a residue, the coke, relatively richer in carbon than the original coal. Coke is hard, brittle, and porous, varying in color from iron-gray to blackish-gray, and more or less of a metallic lustre. It absorbs moisture from the air sometimes to the extent of 30 per cent., and contains an amount of ash ranging from ½ up to 15 per cent. It gives off no smoke in burning, is of great value as a fuel, evolving a very large amount of heat, and is used extensively in smelting ores and for other purposes.

Coker. The old name for a cocoa-nut-tree.

Cold-blast. Air forced into a smelting-furnace at a natural temperature, in contradistinction to a heated blast, which is more economical, but produces iron of an inferior quality.

Cold-chisel. A stout chisel made of steel, used for cutting iron when it is cold.

Cold-eel. The *Gymnotus electricus.*

Cold-hammering. The hammering of metal at a low temperature to give hardness and temper.

Cole. Colewort, or sea-kale.

Cole-goose. A name for the cormorant (*Phalacrocorax carbo*).

Cole-perch. A small fish less than the common perch.

Colhoun, Edmund R., Commodore U.S.N., was born at Chambersburg, Pa., May 6, 1821; appointed midshipman from Missouri, April 1, 1839; attached to sloop "Marion," Brazil Squadron, 1839–41; frigate "Congress," Mediterranean and Brazil Squadrons, 1842–44; Naval School, Philadelphia, 1845; promoted to passed midshipman, July 2, 1845; frigate "Cumberland," Home Squadron, 1846–47. Served in the Mexican war, being present at the first attack on Alvarado, under Commodore D. Conner, and also under Commodore M. C. Perry, at the capture of Tabasco. Receiving-ship at Philadelphia, 1850–51; frigate "St. Lawrence," Pacific Squadron, 1851–53; resigned June 27, 1853. Re-entered the navy as an acting lieutenant, 1861; commanded steamers "Shawsheen" and "Hunchback," North Atlantic Blockading Squadron, 1861–62; was in the following engagements: Roanoke Island, February 7 and 8, 1862; capture of Newbern, March 14, 1862; engagement on the

Blackwater River, below Franklin, Va., October, 1862; commissioned as commander, November 17, 1862; commander steamer "Ladona," North Atlantic Blockading Squadron, 1863; monitor "Weehawken," South Atlantic Blockading Squadron, 1863; took part in the different actions with Forts Sumter, Wagner, Beauregard, etc., from July 10 to September 15, 1863; commanded monitor "Saugus," 1864–65; engaged Howlett's Battery on James River, June 21 and Dec. 5, 1864; took part in the bombardment of Fort Fisher, Dec. 25, 1864, and its capture, Jan. 15, 1865; was on special duty at New York, 1866; fleet-captain, South Pacific Squadron, 1866–67; commissioned as captain, March 2, 1869; commanded monitor "Dictator," 1869–70; flag-ship "Hartford," Asiatic Station, 1873–74; was in command of the Asiatic Station for four months; was then transferred to the "Richmond," flag-ship of the South Pacific Station, being in command of her from August, 1874, to July, 1875; commissioned as commodore, April 26, 1876. Relieved rear-admiral John Rodgers, in command of the navy-yard, Mare Island, Cal., April 17, 1877, of which yard he is at present date commandant.

Collar. The part of a stay which goes over the mast-head. A strap or grommet in which is seized a heart or dead-eye; used for stays, bobstays, bowsprit-shrouds, etc.

In mechanism, a ring of metal placed upon a shaft to prevent motion in direction of the shaft's axis while leaving it free for rotative motion. A collar may be wrought or cast upon the shaft as a part thereof, or it may be a separate piece confined by pins or set-screws.

COLLAR-HEART. See HEART.

Collar-beam (*Obs.*). Formerly, it was the beam upon which the stanchions of the beakhead bulkhead stood. The upper side of it kept well with the upper deck port-sills, and was let down into the spirketing at the side, but its springing over the bowsprit in the middle gave it a form which in timber was not to be obtained without great difficulty; a framing of carlings, with a stanchion on each side, was generally substituted in its place.

Collier. A vessel employed exclusively in the coal-trade.

Collimation, Axis or Line of. The axial line of a telescope, or an imaginary line which passes through the optical centre of the object-glass and the intersection of cross-wires at its focus. The *error of collimation* is the deviation of the line of collimation from its normal position.

Collingwood, Lord Cuthbert, Admiral. A disciple of the famous Nelson, and worthy of all honor for his services and undaunted bearing throughout a long career in the British navy. He played a conspicuous part in the great victories achieved by Lord Howe and Lord St. Vincent (which see), and in command of a line-of-battle ship at the famous battle of Trafalgar he was the first to break the line of the French and Spanish fleets. When Nelson saw him leading his squadron into the enemy's array, he exclaimed, "See how that noble fellow Collingwood takes his ship into action." Firm, mild, brave but prudent, he was adored in the navy, and died, in 1810, deeply regretted.

Collins, Napoleon, Rear-Admiral U.S.N. Born in Pennsylvania. Appointed from Iowa, January 2, 1834.

Promoted to passed midshipman, July 16, 1840.

Commissioned as lieutenant, November 6, 1846; sloop "Decatur," Home Squadron, 1846–49; at Tuspan and Tabasco, Mexican war; steamer "Michigan," on the lakes, 1850–53; commanding store-ship "John P. Kennedy," North Pacific Expedition, 1853–54; steam-frigate "Susquehanna," East India Squadron, 1854–55; navy-yard, Mare Island, California, 1856–57; sloop "John Adams," Pacific Squadron, 1857–58; steamer "Michigan," on the lakes, 1858–60; commanding steamer "Anacosta," Potomac Flotilla, 1861; engagement at Acquia Creek, May 31 and June 1, 1861; commanding gunboat "Unadilla," South Atlantic Blockading Squadron, 1861–62; battle of Port Royal, November 7, 1862; various expeditions on the coasts of South Carolina, Georgia, and Florida, 1861–62.

Commissioned as commander, July 16, 1862; commanding steamer "Octorara," West India Squadron, 1862–63; commanding steam-sloop "Wachusett," special service, 1863–64; on the 7th of October, 1864, Commander Collins, then in the "Wachusett," seized the rebel steamer "Florida," lying within the harbor of Bahia, Brazil; the capture was effected without loss of life.

Commissioned as captain, July 25, 1866; commanding steam-sloop "Sacramento," special service, 1867; navy-yard, Norfolk, 1869–70. Commissioned as commodore 1871, and as rear-admiral 1874. Died in 1876.

Collision. See RULE OF THE ROAD AT SEA.

COLLISION-CLAUSE. See RUNNING-DOWN CLAUSE.

Collop. A cut from a joint of meat.

Colmie. A fifth-year or full-grown coal-fish; sometimes called *comb.*

Colmow. An old word for the sea-mew, derived from the Anglo-Saxon.

Colombo. The principal seaport town and the capital of Ceylon, on its west coast, in lat. 6° 56′ N., lon. 79° 49′ E. Pop. 100,000. The harbor, defended by several forts, is small, and the roadstead is safe only during the southeast monsoon.

Colonnati. The Spanish pillared dollar.

Colorable. Ship's papers so drawn as to be available for more than one purpose. In admiralty law, a probable plea.

Colors. A national flag. In port the colors are hoisted at 8 A.M., and kept flying till sunset. At sea the colors are generally shown on falling in with another vessel. The colors are half-masted as a symbol of mourning, and are hauled down as a token of submission. Dipping the colors is a compliment or salute, but our men-of-war are forbidden to dip their colors except in return for a similar compliment. The boats of a man-of-war are required to keep their colors flying while absent from their ship. In a funeral procession the colors are draped.

In the navies of some European countries, when the colors are hauled down they are received by a commissioned officer, and all persons on deck take off their caps as a mark of respect.

COLOR-CHEST. See SIGNAL-CHEST.

COLOR-LOCKER. See SIGNAL-LOCKER.

Colt. A short piece of rope with a knot on one end, formerly used to start skulkers.

Columba (Lat. "The Dove"). A constellation next to, and to the S.W. of, Canis Major. *a Columbæ* may be found by producing the line joining Procyon and Sirius to about the same distance.

Columbia. A name often given to America in honor of the great discoverer. The patriotic ballad, "Hail Columbia, happy land," was written by Joseph Hopkinson for the benefit of an actor named Fox, and to an air entitled "The President's March," composed in 1789 by a German named Teyles, on the occasion of Gen. Washington's first visit to a New York theatre.

Columbiad. A kind of heavy cannon invented by Col. Bomford. See ORDNANCE.

Columbus, Christopher, a native of Corsica, when the island was under the government of the republic of Genoa, cherished for eighteen years the theory of the rotundity of the earth, and sought to establish it by endeavoring to get the means for sailing in a westerly direction from the shores of Spain. He was doomed to many checks and disappointments, and endured the ridicule of the ignorant. At length, Isabella, the queen of Ferdinand of Spain, caused him to be supplied with ships and provisions that he might make a voyage of discovery in the direction he had indicated. His attempt was attended with danger, for the crew of his ship, impatient of its slow progress, murmured and exhibited a mutinous disposition, but his science, courage, and determination had a happy issue, for in 1492 he discovered San Salvador, in the western hemisphere. A second expedition in 1493–96 conducted him to that of the outlying islands, and he reached the continent of America on a third voyage, in 1498. The discoveries and fulfillment of the theory of Columbus did not reap the recompense to which so much energy and perseverance entitled him. He was pursued by envy and jealousy, and fell a victim to his triumph over ignorance and superstition, dying in poverty at Valladolid, in Spain, 20th May, 1506.

Column. See FLEET TACTICS.

Colures (Gr. *kolouros*, dock-tailed, or cutting the tail; from *kolouein*, to cut, and *oura*, the tail). A term originally applied to any great circle passing through the poles of the heavens. It is derived by some from the fact that one part of each of these circles appears always "cut off" by the horizon. A more probable explanation of the word seems to be "cutting the tail" of the northern constellation,—*i.e.*, passing through the pole star. This star is situated in the tail of the Lesser Bear, a group which appears to have been more anciently figured as a dog; hence the pole star is called the Cynosure (*kunosoura*), "The Dog's Tail" (*kuôn*, *kunos*, a dog, and *oura*, the tail). The word colures has more lately become restricted to the two circles of the system which pass through the four cardinal points of the ecliptic,—the equinoctial and solstitial points, —the former being called the *Equinoctial Colure*, and the latter the *Solstitial Colure*. The equinoctial colure may be regarded as the initial position of the hour-circle; the solstitial colure passes through the poles of the ecliptic as well as those of the equinoctial.

Coma Berenices. See CONSTELLATION.

Comb. The projection on the hammer of a gun-lock, to which the thumb is applied in cocking the piece. A name for the colmie. A wooden form used by riggers in weaving mats, gaskets, etc.

Comber. A long curling wave.

COMBER, BEACH-. See BEACH-COMBER.

COMBER, GRASS-. See GRASS-COMBER.

Combing. See COAMING.

Comb the Cat. To separate the tails of the "cat" by running the fingers through them.

Combustion. The practical means of producing artificial heat. It is the union of oxygen with the carbon and hydrocarbon contained in the various kinds of fuels, most of which are hydrocarbons, and which have been produced by the heat of the sun.

Come. *To come to* is to luff, or bring the ship's head nearer to the wind. *To come to*, or *to come to an anchor*, to let go the anchor. *To come up* a rope or tackle, to slack it off or let it go. *To come up with* a vessel is to overtake her. The anchor *comes home* when it slips through the mud in heaving up,—that is, the anchor is dragged toward the ship instead of the ship being hauled up toward the anchor.

Comity of Nations (Lat. *comitas gentium*). That species of international legal courtesy by which the laws and institutions of one country are recognized and given effect to by another. See INTERNATIONAL LAW.

Command. To order with authority. To direct. To exercise supreme authority over. To lead. The word is also used to express both the order given and the force commanded. It signifies also advantage of position; as, when we say that one place commands another, we mean that it overtops or overlooks the other.

Commandant. The officer in command of a navy-yard or naval station. Under the direction of the Secretary of the Navy he exercises control over every department in the yard, and is held responsible for the preservation of all buildings, stores, and vessels, and for the judicious application of all labor.

He is to see that none but effective men are employed, and that the rate of wages conforms with that of private establishments in the vicinity. He is to see that the officers perform their duties in a proper manner, and that all reports and returns are made at the time and in the manner directed by the department. He is to establish regulations to guard against fire, and cause the entire force of the yard to be organized into fire companies, and drilled once a month.

He will not permit any vessel to be repaired at the yard without an order from the Department, except in an emergency, and all vessels repairing are under his control.

Commandant of Cadets. The executive-officer of the U. S. Naval Academy.

Commander. This title in the British and United States navies has the same derivation as commodore, viz., from the Spanish "*Comendador.*" It was first introduced into the U. S. navy in 1838, when it was enacted that "master-commandants" should be known and styled "commanders," although the pay-bill, approved March 3, 1835, recognized the title. It is the next rank below that of captain, and corresponds with that of lieutenant-colonel in the army.

A commander commands vessels of the third and fourth classes; may be employed as chief of staff to a commodore; on duty under a bureau; or as aid to a flag-officer of either grade on shore-stations.

Commander. A heavy wooden maul, for beating down the eyes of the rigging, and for other purposes where the use of an iron instrument would injure the rigging.

Commander, Master and, or Master-Commandant. For some time after the formation of the regular Royal navy by Henry V., of England, those who attended to the navigation of the ship and the mariners were a totally distinct class from those who superintended the fighting department and the soldiers. The first attempt to unite in one person the two offices may be traced in the now abandoned term of master and commander. The first officer of the rank was Robert Best, appointed September 13, 1667, in the Mediterranean, by Sir John Narborough, to a vessel called the "Orange-Tree."

Commander, Lieutenant-. This intermediate rank between commander and lieutenant was first introduced into the United States service at the reorganization of the navy in 1862. Before that time lieutenants when in command of a small vessel-of-war were styled lieutenants commanding. A lieutenant-commander holds assimilated rank with a major in the army.

A lieutenant-commander may act as aid to an admiral, vice-admiral, rear-admiral, or commodore commanding afloat; as aid or executive of a commanding officer, navigating, or watch-officer in first-, second-, and third-rates; and performs duty at shore-stations or under a bureau, and may be ordered to command a vessel of the fourth class.

Commander-in-chief. The President of the United States is the commander-in-chief of the army and navy, but the title of commander-in-chief is given to an officer in command of an independent fleet or squadron, when appointed as such by the Navy Department. He possesses all the rights, honors, and responsibilities from the date on which his flag is hoisted until it is finally hauled down.

He will make himself well acquainted with the sailing and steaming qualities of the vessels under his command, and inform himself of the quantity of coal each vessel can carry, the amount used in average and in full steaming during twenty-four hours. He will inspect the vessels under his command at least once in six months, and satisfy himself that they are in a state of efficiency to perform any service that may be required.

He will cause the boats of his fleet or squadron, manned and armed, to be frequently assembled, inspected, and exercised in manœuvres in landing, embarking, and boarding vessels. He will see that the vessels of his fleet are frequently practiced in exercises in port and in performing manœuvres at sea; he will frequently exercise the officers in making night- and day-signals to insure accuracy, and he will cause quarterly reports of all general exercises to be made in accordance with the prescribed form, which, with his remarks, are to be forwarded to the Navy Department. He will not inflict punishment upon the people of any civilized nation with whom the United States has treaties, for any violation, alleged or otherwise, of such treaties or of international law; but in the absence of a diplomatic representative, he will enter into correspondence with the authorities of the nation, and will take the earliest opportunity to communicate all the information in his possession to the Navy Department. He is to satisfy himself that the laws and regulations of the navy are maintained on board every vessel under his command, and also that all the special orders of the Secretary of the Navy, through the different bureaus of the Navy Department, are strictly observed.

The commander-in-chief of a squadron, being frequently invested with a great charge, on which the fate of a nation may depend, ought certainly to be possessed of abilities equal to so important a station and so extensive a command. His squadron is unavoidably exposed to a variety of perplexing situations in a precarious element. A train of dangerous incidents necessarily arise from those situations. The health, order, and discipline of his people are not less the objects of his consideration than the condition and qualities of his ships. A sudden change of climate, a rank and infectious air, a scarcity or unwholesomeness of provisions may be as pernicious to the former as tempestuous weather or dangerous navigation to the latter. He ought to have sufficient experience to anticipate all the probable events that may happen to his squadron during an expedition or cruise, and to provide against them. His skill should be able to counteract the various disasters which his squadron may suffer from different causes. His vigilance and presence of mind are necessary to seize every favorable opportunity that his situation may offer to prosecute his principal design; to extricate himself from any difficulty or distress; to check unfortunate events in the beginning, and retard the progress of any great calamity. He should be endued with resolution and fortitude to animate his officers by force of example, and promote a sense of emulation in those who are under his command, as well to improve any advantage as to frustrate or defeat the efforts of his ill fortune.

He should be well acquainted with the principles of naval law, that he may judge with propriety of the proceedings of courts-martial, and correct the errors and restrain the abuses which may happen therein by mistake, ignorance, or inattention.

As he is frequently called upon to represent the government on occasions of great moment, he should be well versed in international law.

He does his utmost to protect the commerce of his country, and to this end causes surveys to be made of all dangers to navigation, and in time of war affords convoy and protection to merchantmen of the United States, and also to the merchantmen of nations which may be in alliance with the United States.

The most essential part of his duty is military conduct. He is required to keep pace with the various improvements in vessels and ordnance, and the changes in fleet tactics in consequence thereof. When preparing a fleet or squadron for sea, in time of war, as the vessels join him, he will furnish each commanding officer with a copy of all general orders, dispositions, private signals, orders of battle, etc., so that they may

have a complete understanding of what they will be called upon to do on going into action.

When the squadron shall put to sea it is frequently exercised in fleet tactics that the officers may become proficient in their duties. When he meditates an attack the commanding officers should be made acquainted with the plan of battle, and his orders should be drawn up with the greatest care; they should be simple, perspicuous, direct, and comprehensive, and should direct the plan to be followed in case either of success or defeat. History and experience confirm the necessity of these observations, and present us with a variety of disasters that have happened on such occasions merely by a deficiency in this material article.

When an admiral conquers in battle, he should endeavor to improve his victory by pushing the acquired advantages as far as prudence directs; when he shall be defeated, he ought to embrace every opportunity of saving as many of his ships as possible, and endeavor principally to assist those which have been disabled. In short, it is his duty to avail himself of every practicable expedient rather than sink under his misfortune, and suffer himself to become an easy prey to an enemy.

Commanding Officer. The officer in actual command of a government vessel. He is a line-officer, and in case of his absence or death, he is succeeded by the line-officer next in rank.

The duties of the commanding officer are very comprehensive, inasmuch as he is not only answerable for any bad conduct in the military government, navigation, and equipment of the ship he commands, but also for any neglect of duty or ill-management in his inferior officers, whose several duties he is appointed to superintend and regulate.

On first joining his vessel he will make a thorough personal examination of her, and will inform himself fully as to the condition of the vessel, her engines and boilers, as also regarding the qualifications of the officers placed under his command. He will be furnished by the commandant of the navy-yard, or by the previous commanding officer of the vessel, if the vessel is already in commission, with a statement of her condition and of her presumed or ascertained qualities, as also with drawings and plans showing the dimensions of the vessel, the arrangement and stowage of the holds, store-rooms, magazines, shell-rooms, shot-lockers, etc.

He will not sail from a port in the United States until the men are watched, quartered, and stationed; and before proceeding to sea, he is, if possible, to exercise the men at the different evolutions, and practice them at target-firing. He will cause a routine of drills to be prepared, and will see that the men are thoroughly conversant with their various duties. He will cause the senior engineer to submit to him, for approval, his watch, fire, quarter, and cleaning bills, showing the specific duties of each member of the force under his charge. He will pay the greatest attention to the health of the crew and the cleanliness of the vessel, frequently inspecting her throughout; he will see that the officers are considerate as regards the health of the men, and that they are not unnecessarily exposed to the sun or to the night-dews, and he will see that all regulations regarding the meal-hours are observed. He will make careful and repeated trials of the vessel, under sail and under steam, with every variety of wind and weather, and will inform himself thoroughly as to her capabilities for every service, and of the length of time that she would be able to keep the sea under steam. He will make a quarterly report of her sailing qualities to the Navy Department in accordance with the prescribed form. When in command of an iron vessel, he will have the bottom examined on every opportunity, being careful that the plates are cleaned and coated with preserving composition as often as necessary, that no injury be done by corrosion, and that no copper articles rest on the bottom in contact with the iron.

On putting to sea he will cause a bright lookout to be kept, and on approaching a foreign man-of-war, or being approached by one under suspicious circumstances, he will have the crew at quarters, ready for battle, and preserve this disposition until he ascertains her intentions. He will not suffer his vessel to be searched by any foreign power under any pretext, nor any officers or men to be taken out, so long as they have power of resistance; if force be used, resistance must be continued as long as possible; if overcome, he is to yield his vessel, but not his men without the vessel.

When a vessel of an enemy strikes her flag in an action, it will be the duty of the commanding officer to send an officer on board, if possible, to demand the captain's sword, and to bring that officer with him, as a proof that the vessel has surrendered; and if, under these circumstances, she should again hoist her flag and continue the fight, she may be destroyed. On taking possession of a captured vessel he will adopt all necessary precautions to prevent her from being recaptured. He will send all the officers and a number of the crew of the captured vessel on board of the vessel he commands, and will preserve all journals, signals, written orders, and important papers, particularly those that certify to the validity of the prize. He will see that prisoners of war are treated with humanity, that their personal property is carefully protected, and that they have the use of such of their effects as are necessary to their comfort, and that they are duly supplied with rations, but he will take care that prisoners of war are guarded and deprived of all means of escape or revolt. When an action is over, it is the duty of the commanding officer of a vessel to repair all damages and put the vessel under his command in good fighting order without delay; to have reported to him the exact amount of munitions of war remaining on board, and to transmit to the commander-in-chief an account of the battle, including a statement of the conduct of the officers and crew under his command, with a list of killed and wounded. Should he be compelled to strike the flag, he is to take special care to destroy all signals and papers, the possession of which by an enemy might be injurious to the United States, and he will keep them so prepared, with weights attached, that they will sink immediately on being thrown overboard.

He will make to the Department, through the commander-in-chief, a full report of any action, chase, or important movement in which the vessel he commands may be engaged, and will also furnish diagrams illustrating the positions and

movements of the vessels, the direction of the wind, the bearing, distance, and outline of land, should any be in sight, and all information which may tend to a clear understanding of the occurrence. He will keep a journal, noting in it all desirable information in regard to the naval forces or armament of foreign powers, with such information regarding commerce, hydrography, etc., as may be useful to the government, and he will communicate immediately to the Bureau of Navigation all hydrographic information which may affect the charts or sailing directions. At the expiration of the cruise the journal will be forwarded to the Bureau of Navigation. He will direct the officers under his command, when visiting foreign ports, to obtain and report to him in writing such information as he may designate, and will himself report to the Navy Department the capacity, power, and speed of the foreign vessels of war he meets with.

He will see that the sailing directions, charts, and light-lists are carefully compared with those of all public vessels that he may meet having later information; will have those of the vessel under his command corrected, and tracings or copies made of any new charts or hydrographic information. He will keep a file of all the hydrographic notices, notices to mariners, and hydrographic information that he receives. He will cause careful surveys to be made, and charts constructed, of any shoals, dangers, or harbors not correctly located, or which may require examination; and, when completed, he will forward them, with all the original data and computations, to the Bureau of Navigation. When passing in the vicinity of doubtful dangers, or where there is an indication of shoal water or danger not on the charts, he will make, unless there be special reasons to the contrary, such search as the weather and other circumstances permit, and will forward the results to the Bureau of Navigation, with a track-chart of the traverses made, soundings taken, etc., and in general fulfill the conditions indicated by the hydrographer for making such examinations.

In a port where there is not a consul of the United States, and on the high seas, commanders of fleets, squadrons, and of single vessels are authorized and empowered by law to exercise the powers of consuls, in regard to mariners of the United States.

Commerce, Modern. The commercial activity of nations has in all ages been taken as constituting a fair measure of their development in civilization, and in most cases the organized international exchanges comprehended in this single word have formed the direct civilizing agency. Asiatic history affords exceptions to this generalization, undoubtedly, if we admit that the ancient Indian and Chinese civilizations can claim any rank with those of modern times in Europe and the West; and again, with Rome there was a form of national energy capable of great results, yet having little in common with the civilization of Europe even in the middle ages. As these ages develop, and as Europe becomes a family of nations, the function of commerce rises to the highest place as a law of development, until now the most powerful agencies of internal movement in every country are no more than equal to the strictly commercial systems of exchange conducted between nations. No one country is independent of the necessity to exchange its products with those of other countries. No people, whatever their nationality or origin, can isolate themselves from other peoples. A force superior to all others compels them to come into the general family of nations, to exchange their products and their services with all others, and to recognize a common interest which no one of them can resist.

Modern commerce is the commerce of even the most recent times greatly intensified, and active to a degree only recently rendered possible. The steamship, as a freighting vessel, is new within a very few years, and the fleets of steamers now almost daily laden for transatlantic trade are scarcely yet known to the country as the facts of magnitude they are. The actual commerce of the United States with Europe conducted by these steamer fleets is enormous, and it increases with a degree of rapidity greater than is represented by the growth of either continent; that is, the demand for these exchanges is itself increasing independently of the increased production of the articles or quantities exchanged. A larger proportion of the wheat crop and of the corn crop of the United States is now demanded and consumed in Europe than at any previous time, and the proportion sold abroad will be still greater hereafter. It is so with many other staples of export, with provisions and meats, with lard, cheese, butter, petroleum, and many other articles. The original inquiry or experiment as to the salable value of any one of these commodities has changed to an imperative necessity for these articles as staples of consumption, and this necessity cannot be delayed or denied. The nations of Europe cannot now dispense with the supply of food furnished by these steam fleets laden with grain and provisions. In place of the hesitating choice with which they were taken but a few years ago, the various forms in which corn is prepared are now unquestionably accepted as a staple food for all classes, and the shipments during the current year are consequently one-third greater than ever before. Having established the position of Indian corn as the best and cheapest grain food for Europe, we need not again apprehend its waste by using it as fuel. Nor will the freight-carrying lines of the interior fail to find a profitable business in moving it across the country to the sea-board.

This outward movement already constitutes a circulation altogether vital to the security of business. If this circulation is clogged or stopped, even for a day, it affects the greatest interests. A week of obstruction would bring on a financial panic, entailing enormous losses, and becoming general in its effects on all other business interests. The value of the export movement is now felt by every farmer in the Mississippi Valley, and the sense of international dependence is keenly felt at every railroad station in the west. Much of the advantage resulting to all the parties to these exchanges is due to the perfection attained in economically handling these staples, and to the triumph over time and distance achieved by railroads and freighting facilities as they now are. If these had not been greatly improved, the value of meats and grains would be eaten up by the cost of transit, and the western producer would have little for the articles themselves. As it is, however, the perfection

attained in freighting is wonderful, both inland and at sea, and the provisions sent to Europe are worth all they cost to the ultimate consumers.

The weekly export of general merchandise—grain and provisions being the chief articles—is now about 10 millions of dollars in value at the port of New York alone, and this average has been maintained now for several months. The highest shipment on a single day was 1,254,500 bushels of grain, wheat, and corn—a quantity nearly approached on one or two other days, and likely again to be reached at any time.

It will be seen by these illustrations that commerce in general has assumed proportions which strikingly illustrate the greater productive capacity of the present age, and the efficiency of all the appliances of business. It could not exist if agricultural production remained where it was twenty-five years ago, nor if railroads, elevators, and steamships were the same as then. It could not supply the necessities of nations with any less efficient machinery than that now in use, and we pass on to these changes and improvements in a great degree unconscious of the magnitude of the general movement.

The following table, giving the aggregate values of merchandise imported into and exported from the United States for ten years, will show the rapid increase now taking place,—the years ending June 30 in each case:

	Value of Imports.	Value of Exports.
1870	$462,377,587	$499,092,143
1871	541,493,708	562,518,651
1872	640,338,376	549,219,718
1873	663,617,147	649,132,563
1874	595,861,248	693,039,054
1875	553,906,153	643,094,767
1876	476,667,871	644,956,406
1877	492,097,540	676,115,592
1878	466,872,846	722,811,815
1879	466,073,775	717,093,777
1880	760,919,875	852,845,943

For the last year—1879–80—the importation of a large amount of gold adds an unusual value to the imports, the merchandise account being *imports* $667,885,565, and the *exports* $835,793,924. The gold and silver coin imported reached the large sum of $93,034,310; the gold and silver exports being $17,142,919. For other years of the table there was little difference between the exports and imports of gold.

This period embraces at least one of the complete cycles of foreign trade characteristic of this country in the great increase of business of 1872 and 1873, followed by the depression of 1874 to 1879. Again, there was a remarkable change in 1879, bringing in a fresh flood of importations in 1880 of more than one hundred millions in value greater than in the previous year. Generally, while the imports have decreased in value, and in some classes of goods have almost ceased to come in as part of the necessary supply, the exports have increased one half, rising from 500 millions in 1870 to 750 millions in 1880. To go a few years farther back the contrast would be still more striking: the average for several years near to 1860 would be about 300 millions; for 1870, about 500 millions; and for 1880, about 750 millions. And in 1879 and 1880 there has been a total cessation of the usual large specie exports, very little being sent, while during 1879 the imports of specie were large, being about 80 millions in excess of any other recent year.

The increase of shipping in the carrying trade is even more decisive, the total tonnage capacity of vessels entering all the ports of the United States from foreign countries being, for

1870	6,270,189	1875	9,143,338
1871	6,994,187	1876	9,715,904
1872	7,769,986	1877	10,406,488
1873	8,394,749	1878	11,530,527
1874	10,009,655	1879	13,772,360

For 1880 the figures would be still larger, and it may be stated that the shipping engaged in foreign trade has doubled within ten years. There would be more satisfaction with this result if the increase had been in American vessels; but, on the contrary, it is almost wholly foreign. The vast fleet of half-employed foreign steamers has been turned into the transatlantic trade with the United States by wholesale, as the best-paying trade of the world, and the only one that offers unlimited opportunity for expansion.

The new transatlantic fleet of steamers is almost wholly under foreign flags. Of the entire tonnage arriving at New York not one steamship is American, and but four of those at other ports, these four belonging to the American line between Philadelphia and Liverpool. The contrast between the nationality of vessels under sail and those under steam is extreme, and it results from the narrow and sordid policy of Congress in regard to the encouragement of steam lines. All European nations faithfully and persistently support the steamship lines, through which alone a successful foreign commerce can now be conducted, and our government, on the contrary, with equal stubbornness and persistence, refuses not only all assistance, but all recognition as vessels under the protection of the United States. The result is that, with a trade the richest in the world, and a vast and daily increasing commerce, we are defeated the moment we leave our own shores.

The commerce of Europe has become more general and more decisive in its influence on remote countries with every step of its general progress. The establishment of regular steamship lines to all countries affording a constant trade was the greatest step of progress, and with its accompanying certainty of mail carriage and of passenger transportation, it has now for twenty years or more constituted the most powerful civilizing agency the world has known. This triumph is almost wholly to be credited to England, as the originator of the steam mail-service by sea, although every other maritime nation has followed the example set by England more or less remotely, several European countries maintaining effective lines of distant service, but none approaching the English in number. Great and regular lines to the Indies, and by the way of the Indies to Australia, were established, and continue as the leading feature of the British mail service; next are the South American and transatlantic lines, South America being reached by lines passing the French and Spanish coasts, and touching at Havre, Bordeaux, Lisbon, and the Azores on their way to Pernambuco; thence to Rio Janeiro and the River Plate, and with extensions through the Straits of Magellan to the west coast of South America, Chili, Peru, Ecuador, and Panama. No less than ten lines of steamers ran in 1877 to 1879 from European ports to South America,—five

English, employing 58 vessels, and five German, French, and Italian, employing 43 vessels,—all being steamships of large capacity and heavily freighted in both directions. The Royal Mail Steamship Company, the oldest of the lines, ran 10 vessels from Southampton to Rio Janeiro and the River Plate, monthly and semi-monthly; the Pacific Steam Navigation Company, with the same number of vessels, ran through to the west coast of South America with a monthly service; the Allan Line, to Brazil, with 10 vessels; the Liverpool, Brazil, and River Plate, with 20 vessels; and the Clyde Line, with 6 vessels, complete the English list. The North German Lloyds and the Hamburgh and South American constitute two German lines; the "Chargeurs Reunis," the "Compagnie Messageries Maritimes," and the "Société Générale Trans-Atlantique," constitute the French lines; and one Italian line, from Genoa, completes the list.

This is an illustration of the extent and completeness of the mail steamship service of modern commerce. It extends to every country having sufficient development to justify communication with Europe, and it radiates from English ports almost universally, although duplicated to a considerable extent from French, German, and Belgian ports. There is always an English line, and there may be, in addition, a French, German, or Italian line. Neither of these last has any general field exclusive of the English. In all this service the United States have no part, except in the "American Line" of four steamers from Philadelphia to Liverpool, and the line of John Roach & Co., of three steamers, from New York to Rio Janeiro. Neither of these lines receives especial recognition or compensation for mail service, although both carry some portion of the mails. Repeated efforts have been made to establish lines, or to obtain from Congress authority for conducting a mail service by sea, but in only two instances have such efforts been successful, and the authority under which they were conducted has some years since expired. The Pacific mail service is now paid by the Australian governments of New South Wales and New Zealand, these two colonial governments uniting in payment for a monthly mail service from Sydney and Auckland to San Francisco, the withdrawal of which would compel a discontinuance of that branch of the Pacific mail steamship service.

Such is the commerce of the present time, briefly reviewed. It is unquestionably in a transition state, and certain to undergo great changes within a comparatively brief period. These changes will not be in the direction of diminished volume or of inferior appliances, but they will probably exhibit a higher and more general appreciation, in the United States at least, of the true function of commerce itself, and a recognition of the duty of every great government to maintain its own proper relation to the necessary exchanges of the world.—*Lorin Blodgett.*

Commission (Lat. *committere*, to commit, to intrust). An instrument in writing in the form of a warrant, or letters patent; a certificate of rank. The chief executive, or the supreme authority of the state, issues commissions to the officers of the army and navy, by virtue of which they hold office and exercise the duties thereof. Such officers are termed commissioned officers to distinguish those of the navy from *warrant*-officers; those of the army from *non*-commissioned officers. By Section 1467, Revised Statutes, line-officers take rank in each grade according to the dates of their commissions.

A commission survives only during the pleasure of the authority whence it emanates. The Duke of Marlborough, while at the height of his power, exerted all his great influence to have his commission as captain-general extended for life; but the lord chancellor of England, having searched the records in vain for a precedent, declared that "a patent for life would be an innovation, to which he would not put the Great Seal" (Earl Stanhope's "Reign of Queen Anne"). It was found that the commission issued to Monk, who as "Restorer of the Monarchy" might claim especial privilege, was made to continue "during pleasure" only. Not satisfied with this decision, Marlborough, during the campaign in Flanders, addressed a personal letter to Queen Anne praying to be made general for life. To this the queen, on consulting with her ministers, returned a positive refusal.

The commission issued to Washington by Congress under date of June 19, 1775, giving him the rank of commander-in-chief of the American army, stated that it was "to continue in force until revoked by this or a future Congress."

Following immemorial custom, all commissions issued to officers in the public service of the United States contain the following: "This commission to continue in force *during the pleasure* of the President of the United States for the time being."

In past years the President of the United States has, on several notable occasions, actually exercised his prerogative, by summarily dismissing officers. But Congress has now limited that power to a time of war. Article 36 of the Articles for the Government of the United States Navy, commonly known as the Articles of War, declares that "No officer shall be dismissed from the naval service except by the order of the President or by sentence of a general court-martial; and in *time of peace* no officer shall be dismissed except in pursuance of the sentence of a general court-martial or in mitigation thereof." Congress has further decreed that under certain conditions the President's order of dismissal shall be void. (Act of June 22, 1874.)

A commission sometimes includes a number of persons associated together for some particular object. The commission issued by Queen Victoria (1858) to Earl Hardwicke and eight others, "to inquire into the best means of manning the Royal Navy," led to the present admirable system of training boys for that navy.

The act of putting a vessel of war "in commission" is accomplished by hoisting, in their appropriate places, the national colors and the pennant of the commanding officer. The commanding officer then assembles the officers and crew, and reads to them the order by virtue of which he assumes command.—*S. B. Luce, Captain U.S.N.*

COMMISSIONED OFFICER. An officer holding a commission from the President, as distinguished from non-commissioned and warrant-officers.

Commissioners, Board of Navy. In 1815

Congress authorized the formation of a board of navy commissioners, which was placed under the superintendence of the Secretary of the Navy, and was charged with all the ministerial duties of the department relating to the procuring of supplies and stores, the collection of materials, the construction, armament, and employment of all the vessels. Commodores Rodgers, Hull, and Porter were appointed the first commissioners. The board was abolished in 1842. See ADMINISTRATION, NAVAL.

Commissioners of the Navy (*Eng.*). Certain officers formerly appointed to superintend the affairs of the navy under direction of the lords commissioners of the Admiralty. Their duty was more immediately concerned in the building, docking, and repairing of ships in the dock-yards; they had also the appointment of some of the officers, as surgeons, masters, etc., and the transport, victualing, and medical departments were controlled by that board. It was abolished in 1831. See ADMINISTRATION, NAVAL.

Commodore. This rank of no remote date in the British service, and only now a brevet rank, so to speak, for a captain in command of a squadron or a division of a fleet, is not noticed in the dictionaries of the 17th century. It is supposed to be derived from the Spanish "*Comendador*," one having command over others, or a company.

Until 1861 captains in the United States navy commanding, or having commanded, squadrons, were recognized as commodores, though never commissioned as such, and wore a broad pennant distinctive of that rank. In 1862 it was established by law as a fixed rank, and in July of that year 18 were commissioned on the active and 17 on the retired list.

A commodore has assimilated rank with a brigadier-general of the army; and the chief naval constructor, paymaster-general, surgeon-general and engineer-in-chief of the navy, bureau officers, rank with commodores.

A commodore may command a division or a squadron, or be chief of staff of a naval force commanded by an admiral, a vice- or rear-admiral; or may command ships of the first class, naval stations, or the vessel of an admiral, vice-admiral, or rear-admiral commanding a fleet.

Companion. The skylights or framing and sash-lights on the upper deck, by which light passes to the deck below. A kind of wooden hood over the staircase of the cabin in small ships. Companions are generally movable.

COMPANION-LADDER. The ladder by which the cabin-officers ascend to or descend from the quarter-deck.

COMPANION-WAY. The staircase or berthing of the ladder-way to the cabin.

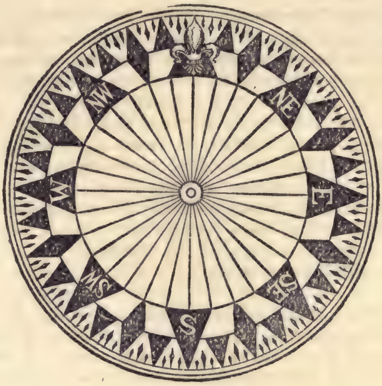
Comparison. The difference between the chronometer and the time-piece used in an observation. *To take a comparison* is to ascertain the difference between the time-piece and the chronometer; this should be done just before and just after the observation.

Compasant. See ST. ELMO'S FIRE.

Compass, The Mariner's. This is probably the most important of all the instruments employed by the navigator, and consists essentially of the *card*, the *needle*, and the *bowl*. It is used for the purpose of pointing out the direction of the ship's track, or the course upon which she is sailing, and is supposed to derive its name from the fact that it includes or *compasses* the whole plane of the horizon.

The card (Fig. 1) is of a circular form, divided

FIG. 1.



at its circumference into thirty-two points of eleven degrees and fifteen minutes each, the points being subdivided into half and quarter points, and when a still smaller division is desired, into degrees. It is also divided into four quadrants of ninety degrees each, the extremities marking these quadrants being called the four *cardinal* points, or north, east, south, and west (written N., E., S., and W.), counting from the top of the card and going around by the right hand, or in the direction in which the hands of a watch move. The north point of the card is generally marked by a *fleur-de-lis.*

The quadrants are again equally divided at every four points, or forty-five degrees, the points marking these subdivisions being given names compounded of the names of the two cardinal points between which they fall, or northeast, southeast, southwest, and northwest (written N.E., S.E., S.W., and N.W.).

The eight points already described may be called the eight *principal* points of the compass.

The points half-way between the four cardinal points and the points N.E., S.E., S.W., and N.W. are given a name composed of the nearest cardinal point and the points last named. Thus, the point midway between N. and N.E. is called north-northeast (written N.N.E.), that between N.E. and E. east-northeast (written E.N.E.), etc., the name of the cardinal point nearest which they fall always coming first.

The points *next* the eight principal points take the word *by* between such principal point and the next cardinal point, the name of the principal point next which they fall coming first. For example, the point next to N. on the right is north by east (written N. by E., or N. b. E.), that next to N.E. on the right, northeast by east (written N.E. by E., or N.E. b. E.), etc.

The quarter point next to N. on the right is north a quarter east (written N. $\frac{1}{4}$ E.), the half point north a half east (written N. $\frac{1}{2}$ E.), the same general rule being observed as in naming the whole points.

In many cases the bearings of objects are given to eighths of a point.

The name of the opposite point to any given point is known at once by simply reversing the name or the letters which indicate the name of the given point. Thus, the opposite of N. being S. and that of E., W., the opposite point of N.E. is S.W., that opposite N.E. by E., S.W. by W., etc.

If the impressions of the card are taken on paper, this should be done after the paper has been cemented to the plate forming the basis, in order to prevent distortion from shrinkage, and also to attain a more perfect centring. This being accomplished, the card is placed upon the *needles*, which consist of laminæ, or layers, of hardened steel, capable of receiving and retaining a high degree of magnetic power. The needles are fastened at equal distances to a light frame-work of brass, and are screwed to the card in a direction parallel to the line joining the north and south points.

In the best form of *air* or *dry* compasses, that used in the English navy, and known as the *Admiralty pattern*, these needles are four in number, the two centre ones being about 7½ inches long and the two outer ones about 5¼ inches. The extremities of these needles are 15° and 45° from the extremities of the diameter of the card which is parallel to them. On the needles small brass balancing-slides are placed, so that the card may be restored to its horizontal position when affected by *dip*. These slides should move freely, but should have sufficient friction to retain them in their places.

Two cards, a light and a heavy one, marked respectively A and J, are supplied with this compass, the former being for ordinary use when the ship is comparatively steady, and the latter for use when there is a great deal of motion. The light card is balanced on a pivot having a point of "native alloy," which is harder than steel, and does not corrode on exposure to the atmosphere. Two spare pivots of hardened steel are also furnished for the light card, and these are gilded by an electrical process. The caps in which these pivots work are centred with ruby or agate, while the cap of the heavy card is centred with speculum metal and ruby-pointed pivots are used.

The pivot should be screwed into the exact centre of the *bowl*, which is made of strong copper, with a glass top, and fitted with gimbals, so that the card may always preserve a horizontal position even when the motion of the ship is most violent. The intersecting point of the axis of the gimbals must coincide with the centre of the card and with the centre of the *azimuth circle*. This latter is a metal circle, graduated to minutes of arc, and fitted with a prism and a sight vane, the latter having a wide opening in which is placed a vertical hair-line exactly opposite the centre of the prism, the line of sight joining the two passing over the pivot. The azimuth circle is made to ship on the circumference of the bowl, and is used in taking bearings. Colored glasses are also fitted to the circle to prevent the glare of the sun from blinding the observer when taking bearings of that body. The azimuth circle is only fitted to the standard compass, the binnacle, or steering compasses, being unprovided with it.

The bowl and the compass-card are placed in a wooden box and the whole in a *binnacle*, which consists of a wooden case mounted on a stand, the top being of brass, fitted with glass, so that the card may be seen, and having lamps at the sides to light up the card at night.

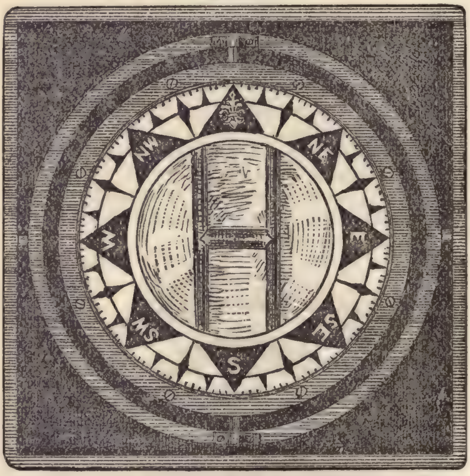
The pivots, caps, and margins of the card should be frequently examined to see that they are in good order and working freely, and when the card works sluggishly or injury from any cause occurs, a new cap or pivot should be screwed in, being careful when screwing the pivot into the bowl to preserve its point from injury and to place the card lightly upon it. When the bowl does not work freely in the gimbals, the axes of the latter and their bouchings should be examined, and, if necessary, slightly rubbed with plumbago. No oil, grease, or other fatty substance should be used for this purpose.

In addition to the fittings already described a screw is fitted to the side of the bowl, by means of which the card may be lifted off the pivot and clamped. When it is necessary to move the compass, or when firing the heavy guns, the card should be raised to avoid injury to the pivot.

The screws attached to the prism plate and to the sight vane receive special adjustment, and should not be touched.

Ritchie's Liquid Compass (Fig. 2), which is used as the regulation compass in the United

FIG. 2.



States navy, consists of a skeleton card mounted on a pivot, and having the bowl filled with a liquid composed of thirty-five parts of alcohol and sixty-five parts of distilled water, the freezing-point of the mixture being about —10° Fahrenheit. In the bowls of the compasses designed for use in the Arctic regions pure alcohol is used.

The needles, which are two in number, each consist of six laminæ of a superior quality of steel, known in commerce as "Stubb's sheet," this having been found the best for the purpose, not only for its uniform excellence, but for its magnetic capacity in both intensity and permanence. Each of these laminæ is six and a half inches long, seven-sixteenths of an inch wide, and about one-fortieth of an inch thick, and each needle weighs a little less than two ounces.

These needles are inclosed in two parallel tubes, which serve also as air-chambers, the tubes being parallel to the line joining the N. and S. points of the card, their ends meeting the rim a little within 30° of this line. These tubes are connected at the centre by a third hollow tube at right angles to them, which supports the cap upon which the card is pivoted. The rim is fitted to form another air-chamber, thus giving great buoyancy to the card.

Great care is exercised in hardening and tempering the laminæ, and, by means of a powerful electro-magnet, they are magnetized to saturation. They are then separately tested for relative magnet power, and the angle of deflection marked on each. Afterwards they are thrown promiscuously into contact for a short time and again tested, any which show a sensible falling off being rejected.

These compasses have given great satisfaction in use, and are found to possess in the highest degree the three great requisites of a good compass, viz., *directive force*, *sensibility*, and *steadiness*. The 7½-inch has been adopted as the regulation size in the navy, and as the azimuth circle that fits one fits all, any compass may be used indifferently as a standard or as a steering compass.

Another great advantage possessed by these compasses is that the pressure on the pivot being only about seventy grains on an average, there is much less frictional error, and of course a much less degree of wear on the caps and pivots than with the card of the air compass, in which the pressure on the pivot with the heavier card may be sixty times as great.

In the tell-tale compasses, which are mounted face downward, the pressure on the pivot is so regulated as to act upward.

Duchemin's Compass (Fig. 3) consists of two concentric circular needles with a steel traverse

FIG. 3.

connecting the poles. The maximum magnetization (shown by the heavy shading) is at the N. and S. points, decreasing gradually to zero at E. and W. The circle is magnetized by a special process, which gives magnetic stability, and placed upon a pivot or suspended by a thread from the centre, it forms a true compass, the N. pole pointing to the south and the S. pole to the north.

In a series of experiments made at sea with this compass, in which it was intentionally exposed to the roughest usage, it proved so satisfactory with regard to sensibility, steadiness, and fixity of the line of its poles, that it has been adopted as the regulation compass in the French navy, and is in use in several lines of merchant steamers.

The magnetic needle is subject to the influences of variation or declination, dip or inclination, and deviation.

On account of the magnetic attraction of the earth there are but few places on the globe at which the compass-needle points to the true north, or in the direction of a terrestrial meridian. The direction that the horizontal needle assumes when uninfluenced by local causes is called the *magnetic meridian*, hence the variation of the compass is the angle included between the terrestrial and the magnetic meridians, and is measured by the number of degrees between the true and the magnetic north. If the N. end of the needle is drawn to the right hand of true north, the variation is called easterly, and if to the left hand, westerly.

The variation of the compass differs at different places, and is constantly, though slowly, changing at the same place, increasing for a certain time, then slowly decreasing for a period, when it again commences to increase. Thus, at Paris, in 1550, the variation was 8° E., in 1660, zero, and in 1769, 20° W. It is also subject to mensual and diurnal changes, the mensual change being according to the season of the year. It was first noticed about the year 1756.

In the diurnal change, a small easterly movement of the needle is observed during the early morning hours, reaching a maximum about 7 A.M. After that time the N. end moves rapidly westward, reaching its extreme westerly position at about 1 P.M. It then returns to the eastward, but more slowly, the easterly deviation becoming a maximum at about 10 P.M. To seamen, however, these small fluctuations are unimportant. The mean daily range of the magnetic needle is about 9.3′.

The needle is also affected by sudden changes in the direction and intensity of the magnetic force. Raper cites a case in which, at Greenwich observatory, the needle was observed to change its direction more than 2½° in eight minutes of time, and similar effects were observed at other places. These sudden disturbances are called *magnetic storms*.

If all places having the same variation be united by lines drawn upon the chart, these lines will be found to describe irregular curves, called lines of equal variation, or isogonic lines. The lines uniting places at which the needle, when uninfluenced by local causes, points to the true north are called lines of no variation, or agonic lines.

The discovery of the variation of the needle from the true north is usually attributed to Columbus during the voyage in which he discovered America, but in one of the earliest treatises on magnetism, written in 1269, the variation of the needle is spoken of. The authenticity of this work has, however, been questioned.

The magnetic needle when placed on a pivot will not retain its horizontal position except on

the magnetic equator, the N. end of the needle dipping and the S. end rising in N. magnetic latitudes, and the S. end dipping and the N. end rising in S. magnetic latitudes. This inclination of the needle to a horizontal plane or to the horizon is called the *dip*, or inclination of the needle, and is different at different places according to their magnetic latitude. The dip, like the variation, undergoes a continual change, which is, however, very small in amount, the decrease at London in the last three hundred years amounting to no more than about four degrees. There is a diurnal change amounting to three or four minutes. Lines drawn on the chart to unite places having the same dip are called lines of equal dip, or isoclinal lines. On the magnetic equator the dip is zero, and at the magnetic poles it is 90°. It is found by means of the dipping-needle, a very delicate instrument. The dip being in some degree a measure of the intensity of the earth's magnetism as well as materially modifying the directive force of the needle, is a matter of great importance to the mariner. At the magnetic poles, where the needle is perpendicular, it has of course no directive force, although at these points the greatest magnetic intensity is developed. The dip was first observed by Robert Norman, an English compass-maker, in 1576.

The Magnetic Equator, of which we have already spoken, is an irregular curve, cutting the terrestrial equator in three points according to some authorities, in four according to others. From the magnetic equator magnetic latitude is reckoned, and at any point on it the magnetic needle will retain its horizontal position, or there will be no dip.

As this curve does not coincide throughout with the terrestrial equator, magnetic latitudes do not correspond everywhere with the common or geographical latitude, differing at some places as much as 13°.

The Magnetic Poles are two spots on the surface of the earth, one in the northern and the other in the southern hemisphere, at which the needle points directly downward, or at which the dip is 90°. The present position of the south magnetic pole is about lat. 70° N., lon. 98° W., and of the north magnetic pole, lat. 74° S., lon. 148° E. The change in the variation previously mentioned has been ascribed to the revolution of these poles around the poles of the earth.

The Deviation of the Compass may be defined to be the angle which the needle makes with the magnetic meridian, and is measured by the number of degrees between this meridian and the line of direction of the needle. It is marked east or west as the N. end of the needle is drawn to the right or left of the magnetic meridian.

The deviation of the compass is caused by the action on the needle of the iron in a ship, whether employed in her construction, equipment, or cargo, and by the action of magnetic forces without the ship, such as exist in volcanic bodies, iron cranes, water-pipes, or in anything that can exert a magnetic influence on the needle. The magnetic influence which one iron ship can exercise upon the compasses of another in close proximity is very appreciable. Lightning may affect the compass needle.

There are different methods of finding the error due to these causes, a description of which will be found in almost any work on navigation, but all consist in bringing the ship's head in succession to each of the thirty-two points of the compass, and then observing the bearing of some object, either celestial or terrestrial, whose true bearing is found either by calculation or by the inspection of tables prepared for the purpose. The difference between the true bearing so found and the bearing shown by compass, *after the variation due to the place has been applied to the compass bearing*, is the error due to local deviation.

As the local deviation differs in iron ships when the ship is on an even keel and when heeling, it should be determined under both circumstances, and in steamers, if this error has been determined with the funnel up, a few bearings should be taken with it down, when, if any considerable difference is observed, the errors should be obtained for both positions of the funnel.

The deviation may be found by bringing the ship's head on every other point of the compass, or even on the eight principal points, the error on the omitted points being obtained by interpolation. Graphic methods of representing the deviation have been devised, the best being that of Napier and the right-line method of Archibald Smith.

After finding the deviation on all the points of the compass, these errors may be either tabulated or the compass may be compensated by means of magnets placed in the deck near the compass. In some iron vessels, where the deviation on particular courses is very large, a combination of the two methods is used, the errors being partially compensated by magnets and the residual error being found by observation and tabulated.

Both methods, the compensation and the tabular, have their advocates. In the United States navy, as well as in the navy of England, uncompensated compasses are used, and the deviations given from the deviation table are applied to the compass courses to find the correct magnetic course steered or to steer. Many merchant vessels use compensated compasses.

As the deviations found for the compasses of a vessel are only good at the place where found, and change, from a variety of causes, after any considerable lapse of time or after considerable change of position, it frequently becomes necessary to move the magnets by which the compensation is effected in order to compensate for the new deviations found. Great difficulty is sometimes experienced in doing this as the magnets are ordinarily fitted. To obviate this difficulty, as well as to furnish a compass possessed of great steadiness and small frictional error, Sir William Thomson has designed an instrument which, while possessing all the qualities of a good compass, can be readily and quickly adjusted for changes of deviation, and which may be described as follows:

The compass-card (Fig. 4) is supported on a thin rim of aluminium, and its inner parts on thirty-two silk threads or fine copper wires stretched from the rim to a small central boss of aluminium. The card itself is of thin, strong paper, and all the central parts of it are cut away, leaving only enough to show conveniently the points and degree divisions of the compass.

The central boss consists of a thin disk of

aluminium with a hole in its centre, which rests on the projecting lip of a small aluminium in-

FIG. 4.

verted cup mounted with a sapphire cap, which rests on a fixed iridium point. Eight small needles from 3¼ to 2 inches long, made of thin steel wire, and weighing in all 54 grains, are fixed like the steps of a rope ladder on two parallel silk threads, and slung from the aluminium rim by four fine copper wires through eyes in the four ends of the outer pair of needles.

The weight of the central boss, aluminium cup, and sapphire cap amounts in all to about 5 grains. It need not be more for a 24-inch than for a 10-inch compass. For the 10-inch compass the whole weight on the iridium point, including rim, card, silk thread, central boss, and needles, is about 180 grains.

By throwing the greater part of the weight of the card to its rim a long period of free oscillation and consequent steadiness is insured, and, owing to the small pressure on the pivot, due to the lightness of the card, there is almost absolute freedom from frictional error. There is a hemispherical space under the compass-case, which being nearly filled with castor oil, serves to calm the vibrations of the bowl.

The apparatus for correcting the error of the compass consists of two solid or hollow iron globes placed on proper supports, and attached to the compass on two sides of the binnacle. These are for the purpose of correcting the quadrantal error, or that caused by the difference of the induced magnetism in fore-and-aft and thwartships horizontal iron. This adjustment having been once made remains correct in all latitudes, unless there is some change in the place of the iron near the compass. To make the correction the globes are placed at a certain distance from the centre of the compass, according to the amount of the deviation to be corrected.

For correcting the semicircular deviation, or that caused by the magnetism of the ship and the induced magnetism of her vertical iron, which changes with lapse of time and with change of latitude, sets of magnets are so arranged in the binnacle as to neutralize the disturbance arising from this cause, as well as that caused by the heeling error. For this latter a vertical magnet, adjustable to the proper height, in a line perpendicular to the deck, through the centre of the compass and of the binnacle, is used.

The inventor has also applied to this compass an azimuth mirror on the principle of the camera lucida, by which the bearings of objects on the horizon can be taken, even if the highest point of the globes used for correcting the quadrantal deviation rises as high as 5 inches above the glass of the compass-bowl. By means of this mirror the readings are taken directly on the card, and it possesses the advantage of not requiring any adjustment of the instrument, such as that by which, in the ordinary azimuth compass, the hair is made to exactly cover the object.

The deviation of the compass-needle was observed by Mr. Wales, who accompanied Capt. Cook as astronomer, in the latter half of the 18th century, but no effort seems to have been made at that time for its correction, it having probably been ascribed to the imperfection of the instruments then employed.

The first attempt to correct the deviation appears to have been made by Capt. Matthew Flinders, who observed it while on a surveying expedition to Australia in the beginning of the present century. He suggested the introduction of an upright iron stanchion so placed as to counteract the ship's attraction, and the explanation which he then gave of the action on the needle of the ship's iron has formed the basis of all subsequent investigation.

The Chinese were perhaps the first people who possessed a knowledge of the properties of the magnetized needle. We are told that as early as 2634 B.C. these people possessed an instrument which would indicate the S. point, thus distinguishing the four cardinal points. Other allusions to the compass are also made in old Chinese records, proving its great antiquity among them.

The Chinese compass has a distinguishing mark at the S. pole instead of at the N., as with us. The needle is seldom more than an inch in length, and is less than a line in thickness. It is peculiarly poised, with its point of suspension a little below its centre of gravity, and is very sensitive. The card has but twenty-four points, reckoned from the S. pole.

The improvement of the mariner's compass has been but a slow process, and during the last forty years it has been brought to a greater degree of perfection than during all of the previous period in which it has been known. During the last few years the introduction of iron in the construction and equipment of vessels has stimulated investigation in order to detect the causes of the vagaries of the needle, and to apply a remedy which should make the compass an instrument upon which reliance could be placed.

Some of the most eminent scientific men of the present day have devoted their energies to the task, and the result is a great improvement in our knowledge of the laws of magnetism as affecting the compass-needle, and in the construction of the compasses now in use.

See the various works on Magnetism and on Navigation. Also, "English Philosophical Transactions; Magnetism of Ships and Deviation of the Compass," republished by the Bureau of Navigation in 1867, especially the article on

the Mariner's Compass from the *London Quarterly Review* for October, 1865; "Naval Science," vol. ii., 1873, articles on Deviation of the Compass; "Elementary Magnetism and Local Attraction of Ship's Compasses," Sunderland, Thomas Reed & Co.; "Finding of the Compass Error," by B. F. Greene, Professor U. S. Navy; Towson on the "Deviation of the Compass in Iron Ships;" "Encyclopædia Britannica," article Compass; "Reports of the Liverpool Compass Commission," republished by the Bureau of Navigation in 1868, etc.—*Charles H. Black, Lieutenant-Commander U.S.N.*

COMPASS, ADJUSTMENT OF. See COMPASS, THE MARINER'S.

COMPASS, AZIMUTH. A compass of superior construction fitted for taking bearings.

COMPASS BEARING. The bearing of an object as taken by the compass. It is distinguished from the *true bearing*, which may be deduced from it by applying the corrections for *variation* and *deviation*. See BEARING.

COMPASS CORRECTIONS. Those quantities which must be applied to directions shown by the needle to give the true directions. There are two such corrections: the *variation* and the *deviation*. See COMPASS, THE MARINER'S.

COMPASS COURSE. The angle which the ship's track makes with the direction of the magnetic needle of the compass. It is distinguished from the *true course*, which may be deduced from it by applying the corrections for *variation* and *deviation*. The correction for *leeway* is also necessary to deduce the course made good from the course steered. See COURSE.

COMPASS, IMPERFECTIONS OF. 1. The pivot must be in the centre of the graduated circumference of the card.

2. The eye-vane and object-vane must each be vertical.

3. The direction of the magnetism of the needle must be parallel to the longitudinal line of the needle.

4. The line joining the eye-vane and object-vane must pass directly over the centre of the card.

The effects of non-conformity with the last two requirements can be ascertained and allowed for, but a failure to meet either of the first two should cause the rejection of the instrument.

COMPASS, STANDARD. One raised above the deck, so that the local deviation will be small and the compass in a good position for observing bearings.

COMPASS, STEERING. The compass by which the vessel is steered. The course is given as per standard compass, and the proper allowance for the difference is made by the officer of the deck.

Compass-timber. Curved or crooked timber.

Complain. When the masts, timbers, blocks, etc., creak, and thus show that there is some internal defect, they are said *to complain*.

Complement. The number of men composing a ship's crew.

Composite Sailing. A combination of parallel and great-circle sailing. See SAILINGS.

Composite Ship. One having a wooden skin and an iron frame-work. Jordan's system is as follows: the whole outer skin, including stem, keel, stern-post, and planking, is of wood; and the frames, beams, kelson, shelf-piece, braces, etc., are of iron. See SHEATHED SHIP.

Compound Engine. A modification of steam-engine in which the steam, having performed a certain amount of work in one cylinder, is admitted to another cylinder of larger dimensions, where additional work is obtained from its remaining expansive force. The primitive method was patented by Hornblower in the year 1781, and improved by Wolf in 1804, by the adoption of higher steam-pressure applied to Watt's expired patents of the double-acting cylinder and separate condenser; and the principle was first introduced on a large scale by Randolph, Elder & Co., of Glasgow, under their patents of 1856, in the steamships "Callao," "Lima," and "Bogota," of the Pacific Steam Navigation Company. Crude as the design was, and using comparatively low-pressure steam, the economy observed, which was 2¼ pounds of coal per hour per indicated horse-power under circumstances when 3½ pounds consumption was considered an excellent performance, caused the system to gradually grow into favor, and it is now almost universally adopted.

In the year 1850 the average of the voyages of the Cunard steamships with plain engines was 13 days outward bound, and 12 days, 16 hours homeward bound; and in 1877 the average of the "White Star" line, with compound engines, was 8 days, 13 hours, 39 minutes outward bound, and 8 days, 10 hours, 30 minutes homeward bound.

The "Gallia," the latest steamer of the Cunard line, made her first voyage from Queenstown to New York in 7 days, 19 hours, under the following conditions:

VESSEL.

Length of keel	430 feet.
Length all over	450 "
Breadth of beam	44 "
Depth of hold	36 "

ENGINES.

Number cylinders, one H. P. and two L. P.	3
Diameter of H. P. cylinder	63 inches.
" " each L. P. cylinder	80 "
Stroke of pistons	5 feet.
Greatest diameter of crank-shaft journals	21 inches.
Cut-off valves on high-pressure cylinder.	
Condensing surface	8,300 square feet.
Condenser tubes, ¾ inch diameter, 9 feet long.	
Independent circulating pumps (Gwynne's).	
Propeller, steel-bladed; weight	24 tons.

BOILERS.

Number of boilers	8
Diameter "	14 feet 6 inches.
Length "	9 " 6 "
Number of furnaces, each	3
Area of grates	538 square feet.
Diameter of boiler tubes	3½ inches.
Length " " "	7 feet.
Area of heating surface	13,000 square feet.
" superheating surface	400 " "

PERFORMANCE.

Steam-pressure, per square inch	75 pounds.
Indicated horse-power (mean of trip)	5,261
Coal per day	98 tons.
Coal per hour per I.P	1.73 pounds.
Speed	14.3 knots.
" at measured mile	16 "
Greatest day's run	383 "

Compound engines can be made much less complicated than plain engines of equal steam-

expanding power. Expansion can readily be carried as far as eight times the original volume without the use of cut-off valves, thus dispensing with a great deal of troublesome machinery. The strains upon the running-gear and crank-shaft are nearly equal throughout the stroke of the piston, and the parts can be made lighter than in the plain engine, where they must be strong enough to withstand the initial pressure of the steam, entailing a consequent increase of friction. Steam cannot be beneficially expanded more than eight times its volume; for even supposing the expansion curve to be an isothermal line, or to follow the imaginary law of Mariotte, a condition that can never be realized in practice, the gain by expanding to sixteen volumes is only four and seven-tenths per cent. more than by expanding eight volumes. To expand eight volumes in the plain engine an extremely complicated apparatus is necessary. See EXPANSION OF STEAM, MARINE STEAM-ENGINE.

When great power is required, it is customary to construct compound engines with three cylinders, one being high pressure and two low pressure, on account of the inconvenient size of the low-pressure cylinder when only one is used. This arrangement also gives a more uniform strain to the crank-shaft.

The ratio of volume between the low-pressure and high-pressure cylinders is usually between three and a half and four to one.

Steam-jacketing and high-pressure steam—two important sources of economy in modern engineering—may be applied to plain engines; but results thus far observed are in favor of the compound engine.—*Albert Aston*, *Chief Engineer U.S.N.*

Compound Screw. Two screws of different pitches acting together on the same axis. In some combinations one screw is within the other, the outer one forming the nut of the inner one, in which case the inner screw does not revolve; or, the two threads may be cut on one continuous piece, one being provided with a fixed nut and the other with a movable nut. Suppose both threads to be either right-handed or left-handed, the resultant motion and consequent force in direction of the axis is represented by the *difference* between the pitches of the screws. The object of this contrivance is to obtain a slow advance due to fine pitch, together with the strength of large threads.

If one screw is right-handed and the other left-handed, the resultant motion is represented by the *sum* of the two pitches. The elevating screws of some classes of ordnance are on this principle. The ordinary "turn-buckle" is another example.—*Albert Aston*, *Chief Engineer U.S.N.*

Comprador (*Sp.*). In the East, one who contracts to furnish meat, vegetables, etc., for a ship.

Compressed-air Engine. An engine similar to the steam-engine, compressed air being the motive force instead of steam. It is especially adapted to locomotive purposes, such as driving street tramway-cars. The air is compressed to any desired tension by large stationary engines, or by water-power, and then heated to a high temperature. It is then received into the reservoirs of the locomotive or street-car, which have sufficient capacity to run to the next station.

Compressor. A curved lever pivoted so as to permit the curve to sweep the lower orifice of the deck-pipe. To the end is hooked a small tackle. When the compressor is hauled to, the chain is jammed between it and the deck-pipe. A mechanism for checking the recoil of a gun.

Comptroller's Office, Second. A bureau of the Treasury Department. Established in 1817. It is the duty of the Comptroller to receive and examine all accounts settled by the Second, Third, and Fourth Auditors, and certify the balances arising thereon to the Secretary of the Department in which the expenditure has been incurred. The Comptroller's jurisdiction is revisory and not original, but in all cases his decision is final and binding upon the Auditor who first passes upon the account or claim. All requisitions of the Secretaries of War and of the Navy on the Treasury for money to be expended by those Departments must be countersigned by the Second Comptroller; and he must report to those Secretaries the official forms to be used in the different offices for disbursing the public money in their respective Departments, and the manner and form of keeping and stating the accounts of the persons employed therein. In case of the death of any petty officer, seaman, or other person not an officer, on board any vessel in the employ of the United States, which has been sunk or destroyed, the Comptroller may prescribe rules to govern the payment of arrears of pay due such person to the persons designated by law to receive the same. The Comptroller is the custodian of the official bonds of all disbursing officers of the War and Navy Departments, and all contracts made by virtue of any law, and requiring the advance of money, or in any manner connected with the settlement of public accounts, if cognizable by the Second Comptroller, must be deposited in his office within ninety days after their respective dates. The Second Comptroller is charged with the preservation of the public accounts subject to his revision, but in all cases such accounts after having been revised are returned to the Auditor from whom they were received, and are placed among his files. The office of the Second Comptroller consists of the Comptroller, Deputy Comptroller, and sixty clerks, and is organized in divisions, as follows: army-pay, navy-pay, quartermaster's, Indian, law and miscellaneous, army pension, and book-keepers.

Concealment, or Suppressio Veri. Consists in the suppression of any fact or circumstance as to the state of the ship, the nature of her employ, and the time of sailing or expected arrival, material to the risk of insurance, and is fatal to the insured. But it is held immaterial to disclose the secret destination of privateers, the usages of trade, or matters equally open to both parties.

Concentrated Fire. See FIRE.

Concentric Engine. An instrument used in scroll engraving, particularly bank-note plate engraving.

Conch. A large univalve, used as a horn by pilots, fishermen, etc., in fogs; a *strombus*, *triton*, or sometimes a *murex*. A name for wreckers of the Bahama reefs; though plunder is their object, the *Conchs* are very serviceable, and evince both courage and address in saving the lives of the wrecked. A nickname for the inhabitants of Key West.

Concluding-line. A small rope hitched to

the middle of the steps of the stern-ladders. Also, a small line leading through the centre of the steps of a Jacob's ladder.

Concussion-fuze. See FUZE.

Condemn. To determine, judicially, the question of title to a captured vessel in favor of the captor. (See PRIZE.) To declare a vessel unseaworthy with a view to her being broken up. To pronounce against the physical capacity of an officer or enlisted man. To declare officially that stores are unfit for use.

Condenser. In the steam-engine, the vessel or apparatus in which the steam is condensed when expelled from the cylinder after having performed its work, and in which a partial vacuum is constantly maintained while the machinery is in operation, the steam being instantly deprived of its latent heat and a portion of its sensible heat, either by direct contact with cold water injected as a "spray," or being exposed to metallic surfaces kept cold by circulating water. When the spray or jet is used, and the water of condensation mixes with the "injection," or refrigerating water, the apparatus is called a "jet condenser"; and when the condensation is produced by contact with metallic surfaces, and the purity of the water of condensation preserved, it is called a "surface condenser." In both cases the uncondensed vapor, the quantity of which depends upon the temperature of the water of condensation, and the air or other gas mixed with the steam, are drawn off by an air-pump.

The surface condenser consists of a box sufficiently strong to resist the atmospheric pressure, usually of cast iron and of rectilinear cross-sections, filled with tubes about ⅝ or ¾ inch diameter, packed water-tight at both ends, the steam being exposed to one surface of the tube, and the refrigerating water, which is generally forced through by a pump, called a circulating-pump, to the other.

The amount of tube-surface exposed to the steam should be about one square foot for each pound of coal consumed per hour. This will insure a good vacuum in any climate. The quantity of refrigerating water may be computed by the formula:

$$W = \frac{w\,(H - T_2)}{T_1 - T_0}$$

in which H denotes the total heat of the steam discharged into the condenser, w its weight, T_0 the temperature of the sea-water, T_1 that of the discharge-water, W its weight, and T_2 the temperature of the water of condensation. From this the volume for any given time may be easily computed. With a jet condenser—

$$T_2 = T_1.$$

The value of T_0 may be generally considered about 80° Fahr. See MARINE STEAM-ENGINE.—*Albert Aston, Chief Engineer U.S.N.*

Condensing Engine. A steam-engine in which the steam, after having performed its work, instead of being expelled into the atmosphere as in a locomotive-engine, is brought in contact with cold water or cold metallic surfaces in an apparatus called a condenser, where it is instantly condensed, thereby producing a partial vacuum and relieving the piston of a greater portion of the atmospheric pressure, and, at the same time, reserving the pure water of condensation for resupplying the boilers. See CONDENSER.

An engine for condensing or compressing matter of any kind.

Conder. A watcher of fishes, the same as balker, huer, and olpis. His employment was to give notice to the fishermen from an eminence which way the shoals of fish were going.

Conductor. A metal rod or wire projecting above the truck and leading thence to the water. Its use is to protect the ship from lightning. See ELECTRICITY.

Cone-buoy. See BUOY.

Cone Valve. A rotating or oscillating valve, the bearing surfaces of which are conical, and which is similar in its action to a cock. The device has never been successfully adopted on a large scale, owing principally to the variable expansion of the metal.

Coney-fish. A name of the burbot.

Confederation, Argentine. The navy of the Confederation consists of 26 steamers, 2 of which are ironclads, and they are manned by 2900 sailors and marines. This navy is commanded by 2 admirals and 74 other officers.

Configuration. Relative position or aspect of the planets; or the face of the horoscope, according to the relative position of the planets at any time.

Confluent. Flowing together; meeting in a common current; as, confluent streams.

Conger. A large species of sea-eel, of the *Anguilla* family (*Conger* of some naturalists). It sometimes attains a length of 10 feet and a weight of 100 pounds.

Congress. An assembly of princes or plenipotentiaries for the settlement of the affairs of peoples or states.

Congress of the United States. The national legislature. For its constitution, powers, and relation to the navy, see CONSTITUTION OF THE UNITED STATES.

Congreve-rocket. A powerful rocket invented by Sir William Congreve.

Conical Valve. A valve with a conical bearing surface. The valve may either lift in direction of the axis of the cone or rotate about it.

Conic Sections. That part of mathematics which treats of the measurements, properties, etc., of the sections of a cone. The curves formed by the cutting of a cone by a plane are the *parabola* (Gr. *paraballein*, to place side by side), the *ellipse* (Gr. *elleipein*, to fall short of), and the *hyperbola* (Gr. *huperballein*, to exceed). When the cutting plane is parallel with the generating line of the cone a parabola is formed; when the inclination of the cutting plane to the base is less than that of the generating line, an ellipse is formed; and when it is greater, we have a hyperbola.

Conjee. Gruel made of rice.

Conjunction. Heavenly bodies are in conjunction when they have the same longitude. The *inferior* conjunction of a planet is its position when in conjunction on the side of the sun nearest the earth; its *superior* conjunction is its position when in conjunction on the side of the sun farthest from the earth. The superior planets have no inferior conjunction.

Conn, Con, or Cun. This word is derived from the Anglo-Saxon *conne*, *connan*, to know,

to be skillful. To direct the course of a ship. The quartermaster conns the ship ordinarily, but on special occasions it is done by the pilot, officer of the deck, navigator, or commanding officer. *At the conn*, at the station for conning the ship.

CONNINGS. Reckonings.

Connaissance des Temps. The French work corresponding to the "Nautical Almanac."

Connecting Rod. A rod connecting the reciprocating parts of a machine with the rotating parts, such as the cross-head or beam with the crank of a steam-engine. The ends of the rod are provided with adjustable bearings fitted to the journals of the cross-head, or beam-centre, and crank-pin. When the length of the rod is great in comparison to its diameter, it is braced by light rods stretched over "struts" or "outriggers."

Consign. To commit goods to a shipmaster for conveyance and delivery to the person to whom they are addressed.

CONSIGNEE. The person to whom goods are sent.

CONSIGNOR. The person who sends goods.

Console-bracket. A bracket or ornament used to support any projections on the outside or inside of the ship.

Consort. Any vessel in company with another.

Constant Battery. See GALVANIC BATTERY.

Constantinople. A celebrated city of Turkey in Europe, and the capital of the Ottoman Empire, in lat. 41° 0′ 18″ N., lon. 28° 59′ 15″ E., situated on a declivity or series of gentle hills at the eastern extremity of a triangular promontory of the province of Roumelia, having the Sea of Marmora and the Bosphorus on the south and east, and the Golden Horn, an inlet of the latter, on the north. It is thus surrounded by water on all sides except the west, and has a sea front altogether of about 8 miles in extent. The city proper comprises several quarters, as those for the Jews, Armenians, and Greeks. The Greek quarter, the "Fanar," extends along the shore of the port, or the Golden Horn. This fine harbor lies between the city and its suburbs Pera and Galata, extending for about 4½ miles inland in a northwesterly direction, and varying in breadth from 1 to 4 furlongs. It is deep enough to float ships of the largest size, and is crossed by two bridges of boats, which unite the Fanar with the northern suburbs. Pop. 700,000.

Constellation (Lat. *con*, together; *stellatio*, a grouping of stars, from *stella*, a star). A group of fixed stars to which a name has been given. These names have mostly their origin in the mythology of the Greeks, derived and modified from the Egyptians and the East; and the stars forming each configuration are ranged and named in order of brilliancy. The districts thus mapped out are entirely arbitrary, and in general correspond to no natural grouping of the stars. "Innumerable snakes twine through long and contorted areas of the heavens where no memory can follow them; bears, lions, and fishes, large and small, northern and southern, confuse all nomenclature." The ancient system has, however, obtained a currency from which it would be difficult to dislodge it; and it serves the purpose of briefly naming remarkable stars,—an important point for the navigator. The following is a list of the principal constellations, with the right ascension and declination of the brightest star in each:

Name.	R. A.	Dec.
	h. m.	° ′
Andromeda, Andromeda	0 2.2	28 26 N.
Antlia, The Air-Pump	10 21.7	30 27 S.
Apus, The Bird of Paradise	14 33	78 32 S.
Aquarius, The Water-Bearer	21 59.6	0 54 S.
Aquila, The Eagle	19 43.9	8 33 N.
Ara, The Altar	17 22.6	49 47 S.
Argo, The Ship Argo	6 21.3	52 38 S.
Aries, The Ram	2 0.4	22 55 N.
Auriga, The Wagoner	5 7.8	45 52 N.
Boötes, The Herdsman	14 10.2	19 49 N.
Cælum, The Sculptor's Tools	4 36.7	42 6 S.
Cameleopardalis, The Giraffe	4 42.1	66 8 N.
Cancer, The Crab	8 51.9	12 19 N.
Canes Venatici, The Hunting Dogs	12 50.4	38 58 N.
Canis Major, The Greater Dog	6 39.9	16 33 S.
Canis Minor, The Lesser Dog	7 33	5 32 N.
Capricornus, The Sea-Goat	20 11.4	12 55 S.
Cassiopeia, Cassiopeia	0 33.7	55 53 N.
Centaurus, The Centaur	14 31.5	60 20 S.
Cepheus, Cepheus	21 15.7	62 5 N.
Cetus, The Sea-Monster	2 56	3 37 N.
Chamæleon, The Chameleon	8 21.6	76 32 S.
Circinus, The Compass	14 32.8	64 27 S.
Columba, Noah's Dove	5 35.3	34. 8 S.
Coma Berenices, Berenice's Hair	13 4.2	18 10 N.
Corona Australis, The Southern Crown	19 1.3	38 5 S.
Corona Borealis, The Northern Crown	15 29.6	27 7 N.
Corvus, The Crow	12 2.2	24 3 S.
Crater, The Cup	10 53.9	17 40 S.
Crux, The Cross	12 19 9	62 26 S.
Cygnus, The Swan	20 37.3	44 51 N.
Delphinus, The Dolphin	20 34.1	15 29 N.
Dorado, The Sword-Fish	4 31.3	55 18 S.
Draco, The Dragon	14 1.1	64 57 N.
Equuleus, The Little Horse	21 9.8	4 45 N.
Eridanus, The River Eridanus	1 33.3	57 51 S.
Fornax, The Furnace	2 44.1	32 55 S.
Gemini, The Twins	7 27	32 9 N.
Grus, The Crane	22 0.6	47 33 S.
Hercules, Hercules	17 9.2	14 32 N.
Horologium, The Clock	4 10	42 35 S.
Hydra, The Sea-Serpent	9 21.7	8 8 S.
Hydrus, The Water-Snake	1 55	62 9 S.
Indus, The Indian	20 29.1	47 43 N.
Lacerta, The Lizard	22 26.4	49 40 S.
Leo, The Lion	10 2	12 33 N.
Leo Minor, The Lesser Lion	10 21	37 19 N.
Lepus, The Hare	5 27.4	17 55 S.
Libra, The Balance	14 44.2	15 32 S.
Lupus, The Wolf	14 34	46 52 S.
Lynx, The Lynx	9 13 8	34 54 N.
Lyra, The Lyre	18 32.9	38 40 N.
Mensa, The Table Mountain	4 59.2	75 8 S.
Microscopium, The Microscope	20 42.5	34 14 S.
Monoceros, The Unicorn	7 35.6	9 16 S.
Musca, The Bee	12 30	68 28 S.
Norma, The Rule	16 10.9	49 52 S.
Octans, The Octant	20 50.2	77 29 S.
Ophiuchus, The Serpent-Bearer	17 29.4	12 39 N.
Orion, Orion	5 48.7	7 24 N.
Pavo, The Peacock	20 16.2	57 7 S.
Pegasus, The Winged Horse	22 58.8	14 34 N.
Perseus, Perseus	3 15.8	49 26 N.
Phœnix, The Phœnix	0 20.4	42 58 S.
Pictor, The Painter's Easel	6 47	61 49 S.
Pisces, The Fishes	1 55.9	2 11 N.
Piscis Australis, The Southern Fish	22 51	30 16 S.
Piscis Volans, The Flying-Fish	9 0.6	65 55 S.
Reticulum, The Net	4 12.9	62 47 S.
Sagitta, The Arrow	19 34.7	17 44 N.
Sagittarius, The Archer	18 16.2	34 26 S.
Scorpio, The Scorpion	16 22.1	26 10 S.
Sculptor, The Sculptor's Workshop	0 52 8	30 0 S.
Serpens, The Serpent	15 38.4	6 48 N.
Sextans, The Sextant	10 1.8	0 13 N.
Taurus, The Bull	4 29	16 16 N.
Telescopium, The Telescope	18 18.1	46 2 S.
Toucan, The Toucan	22 10.3	60 51 S.
Triangula, The Northern Triangles	1 46.3	29 0 N.
Triangulum Australe, The Southern Triangle	16 36	68 48 S.
Ursa Major, The Greater Bear	10 56.3	62 24 N.
Ursa Minor, The Lesser Bear	1 14.6	88 40 N.
Virgo, The Virgin	13 18.9	10 32 S.
Volans. See Piscis Volans.		
Vulpecula, The Fox	19 23.7	24 25 N.

Constitution (Lat. *con*, together, and *statuo*, to place). The collective body of the fundamental laws of a state, whether expressed in

written documents or established by prescriptive usage. In a certain sense, all states in which the power of a sovereign over his people, or classes of his people, is limited by law or legal usage in any particular, may be said to possess, to that extent, a constitution; but in ordinary language only a government in which the power of legislation, or that of granting and withholding supplies to the sovereign, is vested in the people or a body of representatives elected by them, or by a class of them, is termed constitutional.

Constitution of the United States of America, with Amendments. We the people of the United States, in Order to form a more perfect Union, establish Justice, insure domestic Tranquility, provide for the common defence, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish this CONSTITUTION for the United States of America.

ART. 1.—*Sect.* 1. All legislative Powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives.

Sect. 2. The House of Representatives shall be composed of Members chosen every second Year by the people of the several States, and the Electors in each State shall have the Qualifications requisite for Electors of the most numerous Branch of the State Legislature.

No Person shall be a Representative who shall not have attained to the Age of twenty-five Years, and been seven Years a Citizen of the United States, and who shall not, when elected, be an inhabitant of that State in which he shall be chosen.

Representatives and direct Taxes shall be apportioned among the several States which may be included within this Union, according to their respective Numbers, which shall be determined by adding to the whole number of free Persons, including those bound to Service for a Term of Years, and excluding Indians not taxed, three-fifths of all other Persons. The actual Enumeration shall be made within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of ten Years, in such Manner as they shall by Law direct. The Number of Representatives shall not exceed one for every thirty Thousand, but each State shall have at Least one Representative; and until such enumeration shall be made, the State of New Hampshire shall be entitled to chuse three, Massachusetts eight, Rhode-Island and Providence Plantations one, Connecticut five, New-York six, New Jersey four, Pennsylvania eight, Delaware one, Maryland six, Virginia ten, North Carolina five, South Carolina five, and Georgia three.

When vacancies happen in the Representation from any State, the Executive Authority thereof shall issue Writs of Election to fill such vacancies.

The House of Representatives shall chuse their Speaker and other Officers; and shall have the sole Power of Impeachment.

Sect. 3. The Senate of the United States shall be composed of two Senators from each State, chosen by the Legislature thereof, for six Years; and each Senator shall have one Vote.

Immediately after they shall be assembled in Consequence of the first Election, they shall be divided as equally as may be into three Classes. The Seats of the Senators of the first Class shall be vacated at the Expiration of the second Year, of the second Class at the Expiration of the fourth Year, and of the third Class at the expiration of the sixth Year, so that one-third may be chosen every second Year; and if Vacancies happen by Resignation, or otherwise, during the Recess of the Legislature of any State, the Executive thereof may make temporary Appointments until the next Meeting of the Legislature, which shall then fill such Vacancies.

No person shall be a Senator who shall not have attained to the Age of thirty Years, and been nine Years, a Citizen of the United States, and who shall not, when elected, be an inhabitant of that State for which he shall be chosen.

The Vice President of the United States shall be President of the Senate, but shall have no Vote, unless they be equally divided.

The Senate shall chuse their other Officers, and also a President pro tempore, in the Absence of the Vice President, or when he shall exercise the Office of President of the United States.

The Senate shall have the sole Power to try all Impeachments. When sitting for that Purpose, they shall be on Oath or Affirmation. When the President of the United States is tried, the Chief Justice shall preside: And no Person shall be convicted without the Concurrence of two-thirds of the Members present.

Judgment in Cases of Impeachment shall not extend further than to removal from Office, and disqualification to hold and enjoy any Office of honor, Trust or Profit under the United States: but the Party convicted shall nevertheless be liable and subject to Indictment, Trial, Judgment and Punishment, according to Law.

Sect. 4. The Times, Places and Manner of holding Elections for Senators and Representatives, shall be prescribed in each State by the Legislature thereof, but the Congress may at any time by Law make or alter such Regulations, except as to the Places of chusing Senators.

The Congress shall assemble at least once in every Year, and such Meeting shall be on the first Monday in December, unless they shall by Law appoint a different Day.

Sect. 5. Each House shall be the Judge of the Elections, Returns and Qualifications of its own Members, and a Majority of each shall constitute a Quorum to do Business; but a smaller Number may adjourn from day to day, and may be authorized to compel the Attendance of absent Members, in such Manner, and under such Penalties as each House may provide.

Each House may determine the Rules of its Proceedings, punish its Members for disorderly Behaviour, and, with the Concurrence of two-thirds, expel a Member.

Each House shall keep a Journal of its Proceedings, and from time to time publish the same, excepting such Parts as may in their Judgment require Secrecy; and the Yeas and Nays of the Members of either House on any question shall, at the Desire of one fifth of those Present, be entered on the Journal.

Neither House, during the Session of Congress, shall, without the Consent of the other, adjourn for more than three days, nor to any other Place than that in which the two Houses shall be sitting.

Sect. 6. The Senators and Representatives shall

receive a Compensation for their services, to be ascertained by Law, and paid out of the Treasury of the United States. They shall, in all Cases, except Treason, Felony and Breach of the Peace, be Privileged from Arrest during their Attendance at the Session of their respective Houses, and in going to and returning from the same; and for any Speech or Debate in either House, they shall not be questioned in any other Place.

No Senator or Representative shall, during the Time for which he was elected, be appointed to any civil Office under the Authority of the United States, which shall have been created, or the Emoluments whereof shall have been encreased during such time; and no Person holding any Office under the United States, shall be a Member of either House during his Continuance in office.

Sect. 7. All Bills for raising Revenue shall originate in the House of Representatives; but the Senate may propose or concur with Amendments as on other Bills.

Every Bill which shall have passed the House of Representatives and the Senate, shall, before it become a Law, be presented to the President of the United States; If he approve he shall sign it, but if not he shall return it, with his Objections to that House in which it shall have originated, who shall enter the Objections at large on their Journal, and proceed to reconsider it. If after such Reconsideration two thirds of that House shall agree to pass the Bill, it shall be sent, together with the Objections, to the other House, by which it shall likewise be reconsidered, and if approved by two thirds of that House, it shall become a Law. But in all such Cases the Votes of both Houses shall be determined by yeas and Nays, and the Names of the Persons voting for and against the Bill shall be entered on the Journal of each House respectively. If any bill shall not be returned by the President within ten Days (Sundays excepted) after it shall have been presented to him, the Same shall be a Law, in like Manner as if he had signed it, unless the Congress by their Adjournment prevent its Return, in which Case it shall not be a Law.

Every Order, Resolution, or Vote to which the Concurrence of the Senate and House of Representatives may be necessary (except on a question of Adjournment) shall be presented to the President of the United States; and before the Same shall take Effect, shall be approved by him, or being disapproved by him, shall be repassed by two-thirds of the Senate and House of Representatives, according to the Rules and Limitations prescribed in the Case of a Bill.

Sect. 8. The Congress shall have Power To lay and collect Taxes, Duties, Imposts and Excises, to pay the Debts and provide for the common Defence and general Welfare of the United States; but all duties, Imposts and Excises shall be uniform throughout the United States;

To borrow Money on the credit of the United States;

To regulate Commerce with foreign Nations, and among the several States, and with the Indian Tribes;

To establish an uniform Rule of Naturalization, and uniform Laws on the subject of Bankruptcies throughout the United States;

To coin Money, regulate the Value thereof, and of foreign Coin, and fix the Standard of Weights and Measures;

To provide for the Punishment of counterfeiting the Securities and current Coin of the United States;

To establish Post Offices and post Roads;

To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries;

To constitute Tribunals inferior to the supreme Court;

To define and punish Piracies and Felonies committed on the high Seas, and Offences against the Law of Nations;

To declare War, grant Letters of Marque and Reprisal, and make Rules concerning Captures on Land and Water;

To raise and support Armies, but no Appropriation of Money to that Use shall be for a longer Term than two Years;

To provide and maintain a Navy;

To make Rules for the Government and Regulation of the land and naval Forces;

To provide for calling forth the Militia to execute the Laws of the Union, suppress Insurrections and repel Invasions;

To provide for organizing, arming, and disciplining, the Militia, and for governing such Part of them as may be employed in the Service of the United States, reserving to the States respectively, the Appointment of the Officers, and the Authority of training the Militia according to the discipline prescribed by Congress;

To exercise exclusive Legislation in all Cases whatsoever, over such District (not exceeding ten Miles square) as may, by Cession of particular States, and the Acceptance of Congress, become the Seat of the Government of the United States, and to exercise like Authority over all Places purchased by the Consent of the Legislature of the State in which the Same shall be, for the Erection of Forts, Magazines, Arsenals, dock-Yards, and other needful Buildings;—And

To make all Laws which shall be necessary and proper for carrying into Execution the foregoing Powers, and all other Powers vested by this Constitution in the Government of the United States, or in any Department or Officer thereof.

Sect. 9. The Migration or Importation of such Persons as any of the States now existing shall think proper to admit, shall not be prohibited by the Congress prior to the Year one thousand eight hundred and eight, but a Tax or duty may be imposed on such Importation, not exceeding ten dollars for each Person.

The Privilege of the Writ of Habeas Corpus shall not be suspended, unless when in Cases of Rebellion or Invasion the Public Safety may require it.

No Bill of Attainder or ex post facto Law shall be passed.

No Capitation, or other direct, Tax shall be laid, unless in Proportion to the Census or Enumeration herein before directed to be taken.

No Tax or Duty shall be laid on Articles exported from any State.

No Preference shall be given by any Regulation of Commerce or Revenue to the Ports of

one State over those of another; nor shall Vessels bound to, or from, one State, be obliged to enter, clear, or pay Duties in another.

No Money shall be drawn from the Treasury, but in Consequence of Appropriations made by Law; and a regular Statement and Account of the Receipts and Expenditures of all public Money shall be published from time to time.

No Title of Nobility shall be granted by the United States; And no Person holding any Office of Profit or Trust under them, shall, without the Consent of the Congress, accept of any present, Emolument, Office, or Title, of any kind whatever, from any King, Prince, or foreign State.

Sect. 10. No State shall enter into any Treaty, Alliance, or Confederation; grant Letters of Marque and Reprisal; coin Money; emit Bills of Credit; make any Thing but gold and silver Coin a Tender in Payment of Debts; pass any Bill of Attainder, ex post facto Law, or Law impairing the Obligation of Contracts, or grant any Title of Nobility.

No State shall, without the Consent of the Congress, lay any Imposts or Duties on Imports or Exports, except what may be absolutely necessary for executing its inspection Laws; and the net Produce of all Duties and Imposts, laid by any State on Imports or Exports, shall be for the Use of the Treasury of the United States; and all such Laws shall be subject to the Revision and Controul of the Congress.

No State shall, without the Consent of Congress, lay any Duty of Tonnage, keep Troops, or Ships of War in time of Peace, enter into any Agreement or Compact with another State, or with a foreign Power, or engage in War, unless actually invaded, or in such imminent Danger as will not admit of delay.

ART. II.—*Sect.* 1. The executive Power shall be vested in a President of the United States of America. He shall hold his Office during the Term of four Years, and, together with the Vice President, chosen for the same Term, be elected, as follows.

Each State shall appoint, in such Manner as the Legislature thereof may direct, a Number of Electors, equal to the whole Number of Senators and Representatives to which the State may be entitled in the Congress: but no Senator or Representative, or Person holding an Office of Trust or Profit under the United States, shall be appointed an Elector.

The Electors shall meet in their respective States, and vote by Ballot for two Persons, of whom one at least shall not be an Inhabitant of the same State with themselves. And they shall make a List of all the Persons voted for, and of the Number of Votes for each; which List they shall sign and certify, and transmit sealed to the Seat of the Government of the United States, directed to the President of the Senate. The President of the Senate shall, in the Presence of the Senate and House of Representatives, open all the Certificates, and the Votes shall then be counted. The Person having the greatest Number of Votes shall be the President, if such Number be a Majority of the whole Number of Electors appointed; and if there be more than one who have such Majority, and have an equal Number of Votes, then the House of Representatives shall immediately chuse by Ballot one of them for President; and if no Person have a Majority, then from the five highest on the List the said House shall in like Manner chuse the President. But in chusing the President, the Votes shall be taken by States, the Representation from each State having one Vote; A quorum for this Purpose shall consist of a Member or Members from two thirds of the States, and a Majority of all the States shall be necessary to a Choice. In every Case, after the Choice of the President, the Person having the greatest Number of Votes of the Electors shall be the Vice President. But if there should remain two or more who have equal Votes, the Senate shall chuse from them by Ballot the Vice President.

The Congress may determine the Time of chusing the Electors, and the Day on which they shall give their Votes; which Day shall be the same throughout the United States.

No Person except a natural born Citizen, or a Citizen of the United States, at the time of the Adoption of this Constitution, shall be eligible to the Office of President; neither shall any person be eligible to that Office who shall not have attained the Age of thirty five Years, and been fourteen Years a Resident within the United States.

In Case of the Removal of the President from Office, or of his Death, Resignation, or Inability to discharge the Powers and Duties of the said Office, the Same shall devolve on the Vice President, and the Congress may by Law provide for the Case of Removal, Death, Resignation or Inability, both of the President and Vice President, declaring what Officer shall then act as President, and such Officer shall act accordingly, until the Disability be removed, or a President shall be elected.

The President shall, at stated Times, receive for his Services, a Compensation, which shall neither be encreased nor diminished during the Period for which he shall have been elected, and he shall not receive within that Period any other Emolument from the United States, or any of them.

Before he enter on the Execution of his Office, he shall take the following Oath or Affirmation: —"I do solemnly swear (or affirm) that I will faithfully execute the Office of President of the United States, and will to the best of my Ability, preserve, protect and defend the Constitution of the United States."

Sect. 2. The President shall be Commander in Chief of the Army and Navy of the United States, and of the Militia of the several States, when called into the actual Service of the United States; he may require the Opinion, in writing, of the principal Officer in each of the executive Departments, upon any Subject relating to the Duties of their respective Offices, and he shall have Power to grant Reprieves and Pardons for Offences against the United States, except in Cases of Impeachment.

He shall have Power, by and with the Advice and Consent of the Senate, to make Treaties, provided two thirds of the Senators present concur; and he shall nominate, and by and with the Advice and Consent of the Senate, shall appoint Ambassadors, other public Ministers and Consuls, Judges of the supreme Court, and all other Officers of the United States, whose Appointments are not herein otherwise provided

for, and which shall be established by Law; but the Congress may by Law vest the Appointment of such inferior Officers, as they think proper, in the President alone, in the Courts of Law, or in the Heads of Departments.

The President shall have power to fill up all Vacancies that may happen during the Recess of the Senate, by granting Commissions which shall expire at the End of their next Session.

Sect. 3. He shall from time to time give to the Congress Information of the State of the Union, and recommend to their Consideration such Measures as he shall judge necessary and expedient; he may, on extraordinary Occasions, convene both Houses, or either of them, and in Case of Disagreement between them, with Respect to the Time of Adjournment, he may adjourn them to such Time as he shall think proper; he shall receive Ambassadors and other public Ministers; he shall take Care that the Laws be faithfully executed, and shall Commission all the Officers of the United States.

Sect. 4. The President, Vice President and all civil Officers of the United States, shall be removed from Office on Impeachment for, and Conviction of, Treason, Bribery, or other high Crimes and Misdemeanors.

ART. III.—*Sect.* 1. The judicial Power of the United States, shall be vested in one supreme Court, and in such inferior Courts as the Congress may from time to time ordain and establish. The Judges, both of the supreme and inferior Courts, shall hold their Offices during good Behaviour, and shall, at stated Times, receive for their Services, a Compensation, which shall not be diminished during their Continuance in Office.

Sect. 2. The judicial Power shall extend to all Cases, in Law and Equity, arising under this Constitution, the Laws of the United States, and Treaties made, or which shall be made, under their authority;—to all Cases affecting Ambassadors, other public Ministers and Consuls;—to all Cases of admiralty and maritime Jurisdiction;—to Controversies to which the United States shall be a Party;—to Controversies between two or more States;—between a State and Citizens of another State;—between Citizens of different States,—between Citizens of the same State claiming Lands under Grants of different States, and between a State, or the Citizens thereof, and foreign States, Citizens or Subjects.

In all Cases affecting Ambassadors, other public Ministers and Consuls, and those in which a State shall be a Party, the supreme Court shall have original Jurisdiction. In all the other Cases before mentioned, the supreme Court shall have appellate Jurisdiction, both as to Law and Fact, with such Exceptions, and under such Regulations as the Congress shall make.

The Trial of all Crimes, except in Cases of Impeachment, shall be by Jury; and such Trial shall be held in the State where the said Crimes shall have been committed; but when not committed within any State, the Trial shall be at such Place or Places as the Congress may by Law have directed.

Sect. 3. Treason against the United States, shall consist only in levying War against them, or in adhering to their Enemies, giving them Aid and Comfort. No Person shall be convicted of Treason unless on the Testimony of two Witnesses to the same overt Act, or on Confession in open Court.

The Congress shall have Power to declare the Punishment of Treason, but no Attainder of Treason shall work Corruption of Blood, or Forfeiture except during the Life of the Person attainted.

ART. IV.—*Sect.* 1. Full Faith and Credit shall be given in each State to the public Acts, Records, and judicial Proceedings of every other State. And the Congress may by general Laws prescribe the Manner in which such Acts, Records and Proceedings shall be proved, and the Effect thereof.

Sect. 2. The Citizens of each State shall be entitled to all Privileges and Immunities of Citizens in the several States.

A Person charged in any State with Treason, Felony, or other Crime, who shall flee from Justice, and be found in another State, shall on Demand of the executive Authority of the State from which he fled, be delivered up, to be removed to the State having Jurisdiction of the Crime.

No Person held to Service or Labour in one State, under the Laws thereof, escaping into another, shall, in Consequence of any Law or Regulation therein, be discharged from such Service or Labour, but shall be delivered up on Claim of the party to whom such Service or Labour may be due.

Sect. 3. New States may be admitted by the Congress into this Union; but no new State shall be formed or erected within the Jurisdiction of any other State; nor any State be formed by the Junction of two or more States, or Parts of States, without the Consent of the Legislatures of the States concerned as well as of the Congress.

The Congress shall have Power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States; and nothing in this Constitution shall be so construed as to Prejudice any Claims of the United States, or of any particular State.

Sect. 4. The United States shall guarantee to every State in this Union a Republican Form of Government, and shall protect each of them against Invasion; and on Application of the Legislature, or of the Executive (when the Legislature cannot be convened) against domestic Violence.

ART. V.—The Congress, whenever two thirds of both Houses shall deem it necessary, shall propose Amendments to this Constitution, or, on the Application of the Legislatures of two thirds of the several States, shall call a Convention for proposing Amendments, which, in either Case, shall be valid to all Intents and Purposes, as Part of this Constitution, when ratified by the Legislatures of three fourths of the several States, or by Conventions in three fourths thereof, as the one or the other Mode of Ratification may be proposed by the Congress; Provided that no Amendment which may be made prior to the Year One thousand eight hundred and eight shall in any Manner affect the first and fourth Clauses in the Ninth Section of the first Article; and that no State, without its Consent, shall be deprived of its equal Suffrage in the Senate.

ART. VI.—All Debts contracted and Engage-

ments entered into, before the Adoption of this Constitution, shall be as valid against the United States under this Constitution, as under the Confederation.

This Constitution, and the Laws of the United States which shall be made in Pursuance thereof; and all Treaties made, or which shall be made, under the Authority of the United States, shall be the supreme Law of the Land; and the Judges in every State shall be bound thereby, any Thing in the Constitution or Laws of any State to the Contrary notwithstanding.

The Senators and Representatives before mentioned, and the Members of the several State Legislatures, and all executive and judicial Officers, both of the United States and of the several States, shall be bound by Oath or Affirmation, to support this Constitution; but no religious Test shall ever be required as a Qualification to any Office or public Trust under the United States.

Art. VII.—The Ratification of the Conventions of nine States, shall be sufficient for the Establishment of this Constitution between the States so ratifying the Same.

AMENDMENTS.

Art. I.—Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.

Art. II.—A well regulated Militia, being necessary to the security of a free State, the right of the people to keep and bear Arms shall not be infringed.

Art. III.—No Soldier shall, in time of peace, be quartered in any house, without the consent of the Owner, nor in time of war, but in a manner to be prescribed by law.

Art. IV.—The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

Art. V.—No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a Grand Jury, except in cases arising in the land or naval forces, or in the Militia, when in actual service in time of War or public danger; nor shall any person be subject for the same offence to be twice put in jeopardy of life or limb; nor shall be compelled in any Criminal Case to be a witness against himself, nor to be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation.

Art. VI.—In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining Witnesses in his favor, and to have the Assistance of Counsel for his defence.

Art. VII.—In suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury shall be otherwise re-examined in any Court of the United States, than according to the rules of the common law.

Art. VIII.—Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

Art. IX.—The enumeration in the Constitution, of certain rights, shall not be construed to deny or disparage others retained by the people.

Art. X.—The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.

Art. XI.—The Judicial power of the United States shall not be construed to extend to any suit in law or equity, commenced or prosecuted against one of the United States by Citizens of another State, or by Citizens or Subjects of any Foreign State.

Art. XII.—The Electors shall meet in their respective States, and vote by ballot for President and Vice-President, one of whom, at least, shall not be an inhabitant of the same State with themselves, they shall name in their ballots the person voted for as President, and in distinct ballots the person voted for as Vice-President, and they shall make distinct lists of all persons voted for as President, and of all persons voted for as Vice-President, and of the number of votes for each, which lists they shall sign and certify, and transmit sealed to the seat of the government of the United States, directed to the President of the Senate;—The President of the Senate shall, in the presence of the Senate and House of Representatives, open all the certificates and the votes shall then be counted;—The person having the greatest number of votes for President, shall be the President, if such number be a majority of the whole number of Electors appointed; and if no person have such majority, then from the persons having the highest numbers not exceeding three on the list of those voted for as President, the House of Representatives shall choose immediately, by ballot, the President. But in choosing the President, the votes shall be taken by States, the representation from each State having one vote; a quorum for this purpose shall consist of a member or members from two-thirds of the States, and a majority of all the States shall be necessary to a choice. And if the House of Representatives shall not choose a President whenever the right of choice shall devolve upon them, before the fourth day of March next following, then the Vice-President shall act as President, as in the case of the death or other constitutional disability of the President. The person having the greatest number of votes as Vice-President, shall be the Vice-President, if such number be a majority of the whole number of Electors appointed, and if no person have a majority, then from the two highest numbers on the list, the Senate shall choose the Vice-President; a quorum for the purpose shall consist of two-thirds of the whole number of Senators, and a majority of the whole number shall be necessary to a choice. But no person constitution-

ally ineligible to the office of President shall be eligible to that of Vice-President of the United States.

Art. XIII.—*Sect.* 1. Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction.

Sect. 2. Congress shall have power to enforce this article by appropriate legislation.

Art. XIV.—*Sect.* 1. All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the State wherein they reside. No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States; nor shall any State deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws.

Sect. 2. Representatives shall be apportioned among the several States according to their respective numbers, counting the whole number of persons in each State, excluding Indians not taxed. But when the right to vote at any election for the choice of electors for President and Vice President of the United States, Representatives in Congress, the Executive and Judicial officers of a State, or the members of the Legislature thereof, is denied to any of the male inhabitants of such State, being twenty-one years of age, and citizens of the United States, or in any way abridged, except for participation in rebellion, or other crime, the basis of representation therein shall be reduced in the proportion which the number of such male citizens shall bear to the whole number of male citizens twenty-one years of age in such State.

Sect. 3. No person shall be a Senator or Representative in Congress, or elector of President and Vice President, or hold any office, civil or military, under the United States, or under any State, who, having previously taken an oath, as a member of Congress, or as an officer of the United States, or as a member of any State legislature, or as an executive or judicial officer of any State, to support the Constitution of the United States, shall have engaged in insurrection or rebellion against the same, or given aid or comfort to the enemies thereof. But Congress may by a vote of two-thirds of each House, remove such disability.

Sect. 4. The validity of the public debt of the United States, authorized by law, including debts incurred for payment of pensions and bounties for services in suppressing insurrection or rebellion, shall not be questioned. But neither the United States nor any State shall assume or pay any debt or obligation incurred in aid of insurrection or rebellion against the United States, or any claim for the loss or emancipation of any slave; but all such debts, obligations and claims shall be held illegal and void.

Sect. 5. The Congress shall have power to enforce, by appropriate legislation, the provisions of this article.

Art. XV.—*Sect.* 1. The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude.

Sect. 2. The Congress shall have power to enforce this article by appropriate legislation.

Construction and Repair, Bureau of. The bureau of the Navy Department which has charge of dry-docks, of all vessels undergoing repairs, and of the designing, building, and fitting out of vessels. The head of the bureau is the chief constructor of the navy and ranks with a commodore.

Consuls. Commercial agents appointed to reside in the seaports of foreign countries with a commission to watch over the commercial rights and privileges of the nation deputing them. Such officers appear to have been first employed by the Italian republics to protect their merchants engaged in trade in the cities of the Levant. They have been multiplied and extended to every part of the world where navigation and commerce can successfully penetrate, and their duties and privileges are now generally limited and defined in treaties of commerce, or by the statute regulations of the country which they represent. The laws of the United States respecting consuls authorize them to receive the protests of masters and others relating to American commerce, and they declare that consular certificates under seal shall receive faith and credit in the courts of the United States. It is made their duty, where the laws of the country permit, to administer on the personal estates of American citizens dying within their consulates and leaving no legal representative, and to take charge of and secure the effects of stranded American vessels, in the absence of the master, owner, or consignee; and they are bound to provide for destitute seamen within their consulates, and to send them at the public expense to the United States. It is also made their duty to reclaim deserters, to discountenance insubordination and to lend their aid to the local authorities for that purpose, and to discharge seamen cruelly treated. No representative or diplomatic character attaches to consuls except by treaty, nor can they be invested with judicial powers except with the consent of the government of the country in which they reside.

Consular Agents. Subordinates of consuls, who exercise their powers at ports or places different from those at which their principals are located.

Consul-general. A consul having jurisdiction in several places, or over several consuls.

Deputy-consuls. Subordinates of consuls, who exercise their powers and perform their duties at the same ports or places in which their principals are located. See Commercial Agent.

Vice-Consuls. Consular officers temporarily holding the place of consuls during the absence of the latter, or when they have been relieved. The vice-consul has no powers or functions when the consul is present at his post.

Consus. A title of Neptune.

Contact. A touching or meeting of bodies.

Contents. A document which the master of a merchantman must deliver to the custom-house searcher before he can clear outwards; it describes the vessel's destination, cargo, and all necessary particulars.

Continental System. In modern history, the celebrated plan of the Emperor Napoleon for excluding the merchandise of England from all

parts of the continent of Europe. It was commenced by the decree of Berlin, issued November 21, 1806, which declared the British islands in a state of blockade, and made prisoners of war all Englishmen found in the territories occupied by France and her allies. The blockade thus instituted was far from complete; and in the course of events licenses were expressly granted by the government for its evasion, and became a source of revenue. Some writers have affirmed that British commerce lost by this decree and those which followed it more than sixty millions sterling in eighteen months, but this is an enormous exaggeration.

Continents. Continents are the natural grand divisions of the earth's surface. There are six continents; viz., Asia, Africa, Europe, North America, South America, and Australia. To these may be added, provisionally, the Antarctic Continent, lying about the south pole.

1. Asia is the largest, and was the first civilized portion of the globe. It extends from Singapore, in lat. 1° 17′ N., to Cape Severo, in 78° N., and from East Cape, in lon. 169° W., to Cape Baba, in 26° E. lon., covering an area of 17,500,000 square miles. It is nearly square, with many outlying peninsulas. Its shores are washed by 3 oceans, and it has numerous gulfs, bays, and seas, there being no less than 13 large seas washing its shores. Many islands also line its coast. Its mountains are the highest in the world, the Himalaya, Hindoo Koosh, Thian-Shan, and Yablonoi ranges being the principal ones. Its many rivers are large, the Obi, Yenisei, Lena, Amoor, Hoang-Ho, Yang-tse-Kiang, Cambodia, Irrawaddy, Burramapootra, Ganges, Indus, Tigris, and Euphrates being chief among them. The northern part consists of extensive plateaus, sloping to the Arctic, the central of elevated table-lands, surrounded by high mountain chains, and the eastern and southern portions of alluvial plains.

The great desert of Gobi extends through the centre, and much of Arabia is also desert land. The predominating races that inhabit Asia are of the Caucasian and Mongolian families. There are 780,500,000 people, or about 44 to the square mile. China, Russia, Persia, Turkey, and Great Britain are the predominating powers. The entire coast of Asia has been explored, but much of the interior is yet unknown.

2. Africa is a vast peninsula, connected to Asia by the Isthmus of Suez, and separated from Europe by the Mediterranean and the Straits of Gibraltar. Its northern cape is Blanco, in lat. 37° 21′ N., its southerly, Agulhas Cape, in 34° 53′ S.; its easterly point, Cape Guardafui, in 51° 30′ E., and its westerly, Cape Verde, in 17° 33′ W. lon. It contains some 12,000,000 square miles, inhabited by 80,000,000 people, or about 7 to the mile. It is a solid mass, with an uninterrupted coast-line, there being few indentations and no peninsulas. The Mediterranean, the Red Sea, Indian Ocean, and Atlantic wash its coasts. Long an unknown land, it is the field of modern exploration, and is becoming better known. Its uniform coast-line corresponds with its uniformity of surface. The southern table-land, from 3000 to 4000 feet high, is separated from the coast by ranges of mountains. From 15° S. to 15° N. is a vast table-land with a depressed lake region, and north of 15° is the great Sahara Desert, only varied by the fertile lands near the coast and the alluvial plain of Egypt. The principal rivers are the Nile, Zambesi, Orange, Congo, Niger, and Senegal. The chief mountain ranges are the Atlas, the Kong, Drachenberg, and the Samen ranges. Many large lakes exist, the Victoria and Albert Nyanza, Ngami, and Tchad being the largest. The inhabitants belong to 7 races, negroes predominating. The most powerful rulers are the Sultans of Morocco, Tunis, and Zanzibar, the king of Abyssinia, pacha of Egypt, and Great Britain and France in their colonies of Cape Colony and Algiers.

3. Europe is the most populous, but, next to Australia, the least continent of the globe. It extends from Cape Tarifa, lat. 36° N., to Nordkyn, in 71° N. lat., and from Cape Da Roca, 9° 30′ W. lon., to 66° E. lon., containing 3,767,222 square miles, inhabited by 280,000,000 people, or 75 to the mile. These are of the Caucasian race, and are far in advance of others in progress and civilization.

Europe is penetrated by many seas and gulfs, and has many outlying peninsulas, giving her an extended coast-line. Many large and important islands lie near the coasts, Great Britain chief among them. By far the greater part of the country, including Russia, North Germany, Belgium, and Holland, is a fertile plain sloping to the ocean. The principal mountain ranges are the Alps, Pyrenees, Caucasus, Ural, and Scandinavian Mountains. There are no deserts, but the arid steppes of Russia and the puztas of Hungary approach them in character. The Volga, Danube, Dnieper, Don, Rhine, Elbe, Vistula, Loire, Rhone, Tagus, and Po are the principal rivers, and there are numerous large lakes.

4. North America extends from Point Barrow, in lat. 72° N., to Cape Mariato, in lat. 8° 30′ N., and from York Point, lon. 56° W., to Cape Prince of Wales, 156° W. lon., containing 7,400,000 square miles, with a population of 74,000,000, or 10 to a mile. Three oceans wash the coasts, and numerous large seas, gulfs, and bays indent them. All the natural features are on a large scale. The rivers are the largest in the world. The chief ones are the Yukon, Mackenzie, St. Lawrence, Mississippi and its tributaries, Rio Grande del Norte, Colorado, and Columbia. More lakes, and larger ones, are found in North America than in any other country. The chief ones are those of the great St. Lawrence basin, but the country north of this contains great numbers of very large ones. The great mountain chains are the Rocky Mountains in the west and the Alleghanies in the east. There are many volcanoes. A great part of the country consists of fertile plains, well watered and fruitful. North America is divided between the United States, Great Britain, Denmark, Mexico, and the Central American States.

5. South America extends from the southern limit of North America, to which it is connected by the Isthmus of Panama, to Cape Froward, 54° S., and from lon. 35° W. to 83° W., containing 6,500,000 square miles. It much resembles Africa in being a solid mass, with few indenting bays and outlying islands. It possesses many large rivers, the Amazon, La Plata, Para, San Francisco, Orinoco, Negro, and Magdalena being the principal ones. It has a high range of mountains, the Andes traversing it from

north to south, leaving a narrow coast on the west side, and other ranges near the coast of Brazil. The interior consists of vast well-watered plains, called pampas and llanos. Much of it has not been explored. The continent is sparsely inhabited by 30,000,000, or 5 to a mile, of Indians and Europeans, with half-breeds.

6. Australia, the smallest continent, extends from Cape York, 10° 39′ S., to Wilson's promontory, 39° 12′ S., and from Cape Byron, lon. 113° 5′ E., to Steep Point, 153° 16′ E., containing some 3,000,000 square miles, inhabited by 1,336,000 people, natives of the peculiar Papuan race, and European settlers. It belongs to Great Britain. The largest river is the Murray. A range or two of mountains exist, but most of the elevations are detached. Few lakes exist, and they are of a peculiar nature, very shallow, and disappearing quickly in warm seasons. Much of the interior is unexplored. A few large cities are built on the continent, mostly in the southern part.

7. Antarctic Continent. A name given to the tracts of land seen about the South Pole, named Adelie, Enderby, Ballemny, Sabrina, Victoria, Louis Philippe, Graham, and Wilkes Lands. First seen by Wilkes in 1842; its highest latitude yet found was 78° S., by Sir James Ross,—a high mountainous land, fringed by ice.—*F. S. Bassett, Lieutenant U.S.N.*

Contingent. The quota of armed men, or pecuniary subsidy which one nation gives to another in pursuance of an agreement.

Continuous-service Certificate. All men who enlist for three years, except officers' cooks, stewards, and servants, will receive, upon the expiration of their enlistments, if they shall so elect, continuous-service certificates in lieu of the ordinary or honorable discharges.

All persons holding continuous-service certificates will be entitled to receive for each continuous re-enlistment for three years, within three months from the date of their discharge, one dollar per month in addition to the pay prescribed for their several ratings; but a person failing to re-enlist within three months from the date of his discharge will cease to derive any advantage from his previous continuous enlistments.

The continuous-service certificate will embrace all the advantages of an honorable discharge in cases where persons are recommended for the same, and must always show, in the column for the purpose, whether or not the person is entitled to an honorable discharge.

Cont-line. The space between the bilges of two casks stowed side by side. The space between the strands of a rope; when a rope is served this space is filled up with the worming so that the service will be smooth.

Contraband (It. *contra*, against; *bando*, an edict or proclamation). In commercial language, goods exported from or imported into a country against its laws.

Contraband of War. Such articles as a belligerent has by the law of nations the right of preventing a neutral from furnishing to his enemy. See International Law.

Contract. Supplies for the navy are, as far as practicable, purchased by contract. The Secretary of the Navy is forbidden by law to make any contract except under a law authorizing the same, or under an appropriation adequate to its fulfillment, and excepting also contracts for subsistence and clothing. All persons employed in the navy are prohibited from having any interest whatever in purchases or contracts for supplies for the navy, and from receiving, directly or indirectly, any emolument or gratuity from any contractor or other person furnishing supplies, and from acting as agent or attorney for any such persons. No action will lie against an officer upon contracts made by him in his official capacity for public purposes, and within the legitimate scope of his duties.

Contract of Affreightment. See Charter-party.

Contribution. A tax levied upon a conquered country in lieu of confiscation of property, and as some indemnity for the expenses of maintaining order and affording protection. General average (which see). The ratable proportion which each of several underwriters pays when more than one insurance has been effected on the same risk.

Controller. A cast-iron block with depressions on the upper surface which fit the links of the cable and prevent its running out. It can be thrown out of gear by means of a short lever.

Convict-ship. A ship appropriated to the use of convicts, or one chartered to convey convicts to their destination.

Convoy. A merchant vessel or fleet of merchant vessels protected by an armed force. The ship or ships which conduct and defend merchant vessels while proceeding to their destination.

Convoy-instructions. The written or printed regulations supplied by the senior officer to each ship of the convoy.

Convoy-list. A register of the ships composing the convoy.

Conyngham, Gustavus, Captain. A native of Ireland, emigrated to the United Colonies about the year 1767; became an apprentice to Capt. Henderson, then in the Antigua trade, and continued with him as sailor and mate until, by Capt. Henderson's death, he was promoted to the command of the vessel in which he had been serving, the "Molly." Capt. Conyngham continued in the same trade until the commencement of our Revolutionary war, when he went to Europe with Mr. Jonathan Nesbit, who obtained for him a commission for a privateer from Dr. Franklin and Silas Deane. Having received his commission he proceeded to Dunkirk, where a vessel was purchased and fitted out for a cruise in the British Channel. This was one of the first privateers that appeared in those seas under our flag. She was so successful in capturing British vessels that the name of Conyngham became a terror in the Channel. He generally burnt or destroyed his prize-vessels. In 1778 he was captured, and treated with such severity that Congress, by resolution (July 17, 1779), directed their Secretary to write in their name to the admiral or commanding officer of the British fleet lying in the harbor of New York to demand the reasons of his being treated "in a manner contrary to the dictates of humanity and the practice of Christian civilized nations;" and they directed, in the event of a satisfactory answer not being given, that the Marine Committee should "immediately cause to be confined, in close and safe custody, such

and so many persons as they may think proper, in order to abide the fate of the said Gustavus Conyngham." On the 13th of December following Congress refused to allow Christopher Hele, then a prisoner, to be exchanged or to go upon his parole, declaring, by resolution, that he must abide the fate of Capt. Conyngham. After Capt. Conyngham was captured a print was exhibited in London as his exact likeness, and thousands flocked to see it. This print represented him as a man of gigantic stature, with shoulders of extraordinary breadth, and his whole person indicating great strength, with a countenance ferocious in the extreme, holding in his right hand a drawn sword at least six feet in length. Underneath the print was painted in large letters, "The Arch Rebel." Admirable likeness! Conyngham was short, very slender, and his visage remarkably thin, but he was very active and full of spirit. His health suffered greatly during his confinement, of which he complained until his death.

Cook, James, Captain. One of the most scientific and adventurous officers in the British navy. Deputed to the South Pacific, in 1768, to observe the transit of Venus, he seized the opportunity of exploring the coast of New South Wales. Four years later he was sent to find a land supposed to exist in high southern latitudes; but he did not discover any territory as high as 70° S. lat. He, however, came on an island which stands on the charts as New Caledonia. In 1776, Cook explored Behring's Strait, and in the following year, sailing into the Pacific, he discovered the Sandwich Islands. At Hawaii he was set upon by the savages and killed.

Cook. To concoct or prepare; hence to tamper with or alter; as, to cook a sight, that is, to so change the data as to make the final result coincide with the observer's wishes.

Cook, Mess. A man detailed from each mess whose duty is to draw from the paymaster the food to which his mess is entitled, to prepare it for cooking and deliver it to the ship's cook, to receive it from the galley when it is cooked, and to attend to the cleaning and arranging of the mess-gear. He is generally selected from the landsmen of the mess, and ordinarily receives from the members of his mess a compensation equal to the value of one ration.

Cook, Officer's. The cook to the commander-in-chief, cabin cook, wardroom cook, steerage cook, and warrant-officer's cook do the cooking for their respective messes. They are not entitled to continuous-service certificates, nor to the benefit of an honorable discharge.

Cook, Ship's. A petty officer who has charge of the galley and superintends the cooking for the whole ship's crew. He brings a sample of the dinner for the day to the mast at seven bells, where it is inspected by the officer of the deck. In early days the position of ship's cook was a lucrative one; he was entitled to a share of the slush-money, and received an allowance for extra cooking; as, scouse, early coffee, etc. At present the early coffee is authorized by the government, and the slush-money is devoted to the ship's use.

Cook-house. The caboose containing the cooking apparatus.

Coom. The crest or comb of a wave. See Comb.

Cooming. See Coaming.

Cooper, George H., Commodore U.S.N. Born in New York. Appointed from New York, August 14, 1837; attached to fleet operating on coast of Florida, 1837, and was constantly employed co-operating with the army in boat expeditions against the Seminole Indians; frigate "Constitution," Pacific Squadron, 1838–42; Naval School, Philadelphia, 1843.

Promoted to passed midshipman, June 23, 1843; schooner "Flirt," Home Squadron, 1846–47.

The "Flirt" reported for duty to Gen. Zachary Taylor in March, 1846. Passed Midshipman Cooper commanded a detachment of men at Point Isabel, Texas, under Major Monroe, of the U. S. army, previous to and after the battles of May 8 and 9. After the capture of Monterey, was transferred to Commodore Connor's squadron, and was in both attacks on Tabasco, and attacks on Alvarado and Tuspan. Served in the squadron until the reduction of the capital. Receiving-ship, Norfolk, 1847–48; naval station, Norfolk, 1849–50; steam-frigate "Susquehanna," East India Squadron, 1850–55.

Commissioned as lieutenant, May 8, 1851; rendezvous, Norfolk, 1856; ordnance duty, Norfolk, 1857; steam-frigate "Roanoke," Home Squadron, 1859–60; navy-yard, Portsmouth, N. H., 1861.

Commissioned as commander, July 16, 1862; commanding steamer "Massachusetts," supply-vessel, Atlantic Squadron, 1862; commanding steamer "Mercedita," South Atlantic Blockading Squadron, 1863; was seven weeks in command of monitor "Sangamon," inside of Charleston Roads, employed on picket duty, and acting in concert with the army, constantly shelling Fort Sumter and the batteries on Sullivan's Island; stationed in Stono Inlet, S. C., as senior-officer, co-operating with the army in expeditions against the enemy, and frequently engaged at short range; commanding steamer "Sonoma," South Atlantic Blockading Squadron, 1863–64; commanding steamer "Glaucus," East Gulf Blockading Squadron, 1864–65; commanding steamer "Winooski," special service, 1866–67; navy-yard, Norfolk, 1867–69.

Commissioned as captain, December 2, 1867; commanding steam-frigate "Colorado," Asiatic Squadron, 1870–71; navy-yard, Norfolk, 1872; commanding "Roanoke," 1873–74.

Commissioned as commodore, June 5, 1874; commandant navy-yard, Pensacola, 1875–76; light-house inspector, 1876–77; president board of inspection, 1877–78; commandant navy-yard, New York, 1880.

Cooper, James Fenimore, novelist. Born at Burlington, N. J., September 15, 1789; died at Cooperstown, N. Y., September 14, 1851. He studied at Yale, but did not graduate, and in 1811, after six years' service in the navy, married a Miss De Lancey, and settled at Mamaroneck, N. Y. His first work, "Precaution," published anonymously in 1821, was followed by "The Spy," "The Pioneers," 1823, and the "Leather-stocking Tales," which gave him great popularity. This was increased by his sea novels, "The Pilot," "Red Rover," "Water-Witch," "Two Admirals," "Wing and Wing," etc., and by "The Bravo," "Heidenmaur," and "Headsman," published during a visit to Europe

in 1826–33. After his return he published "Letters to his Countrymen," "Homeward Bound," and "Home as Found," which somewhat lessened his popularity. Besides his works of fiction, he wrote a "History of the United States Navy," (2 vols. 8vo), "Battle of Lake Erie," 1843, "Lives of American Naval Officers" (2 vols. 12mo), 6 vols. of "Gleanings in Europe," "Sketches of Switzerland," and a comedy, performed at Burton's theatre, New York, in 1850. The latter part of his life was imbittered by quarrels and lawsuits with the editorial fraternity. His latter productions were unworthy the high fame which Mr. Cooper justly deserved and enjoyed.

Co-ordinates. A set of lines, angles, or planes, or a combination of these, which, taken together, define the position of a point, or points. There are two systems of co-ordinates, the *rectilinear* and the *polar* system.

CO-ORDINATES FOR THE CELESTIAL SPHERE.

Ecliptic System. Latitude and Longitude.

Equinoctial System. 1. Right Ascension and Declination. 2. Hour-angle and Polar Distance.

Horizon System. Azimuth and Altitude.

CO-ORDINATES FOR THE TERRESTRIAL SPHERE.

Latitude and Longitude.

Coot. A water-fowl of the genus *Fulica*, frequenting lakes and other still water. The common coot has a bald forehead and a black body; the toes are long and not webbed, but bordered by a scalloped membrane. The name is sometimes applied to a stupid person.

Cop, or Copt. The top of a conical hill.

Cope. An old word for cape. *To cope* is to bend or arch.

Copeck. A Russian copper coin, a hundred of which make a rouble; it is worth about three-quarters of a cent.

Copenhagen. The capital of Denmark, and one of the finest cities of Northern Europe, situated on the sound, chiefly on the east coast of Seeland, but partly on the island of Amager, which is separated from Seeland by a narrow arm of the sound, which forms a harbor, spacious, deep, and secure. Lat. 55° 40′ 9″ N.; lon. 12° 34′ 7″ E. The shipping of Copenhagen is extensive, nearly all the heavy trade of the kingdom centring there. Pop. 198,000.

Copernican System. Nicholas Copernicus was born at Thorn, Prussia, in 1473; died 1543. A few days before his death the printing of his book on the "Revolution of the Celestial Bodies" was completed. The Copernican system represents the sun to be at rest in the centre, and the planets to move round it in ellipses; in other words, it is that which we now know to be the true system of the universe. It receives its name from Copernicus, but, in point of fact, it may be described as being a growth to which he was only one of many contributors.

The merit of having first formed the general notion of the system seems to be due to Pythagoras; Copernicus has the credit of having, after the lapse of centuries, again drawn the attention of philosophers to it, and of having greatly increased the probability of its truth by his calculations and arguments. The most valuable part of the "De Revolutionibus" is that in which is explained, for the first time, the variation of the seasons, the precession of the equinoxes, and the stations and retrogradations of the planets. In general, the explanations are right, and perfect as to the general nature of the causes of the phenomena.

Copill. An old term for a variety of the coble.

Copper (Lat. *cuprum*, a corruption of *Cyprium*, from the island of Cyprus, whence it was formerly brought). A reddish, malleable, tenacious, ductile metal, of which the symbol is *Cu*; specific gravity, 8.7 to 8.9; fusing-point, about 2000° Fahr. It is found native and in various ores; as, copper pyrites, copper glance, red oxide of copper, and malachite. Its salts are generally poisonous, but brilliant, and used extensively in the arts. Its uses are various; alloyed with tin or zinc, it is used in bells, ordnance, and machinery; drawn out into wires, it is used for lightning conductors and electrical cables; beaten out into thin sheets, it is used for sheathing wooden ships, in which case the fastenings should be of copper. The green rust which forms on the sheathing of ships is a carbonate of copper, and is very poisonous.

The sulphate of copper, or blue vitriol, is employed in the preservation of timber from dry rot.

COPPERED, or COPPER-BOTTOMED. Having the bottom sheathed with thin sheets of copper, to protect the planking from mollusks, cirripeds, and weed.

COPPER-FASTENED. A ship is *copper-fastened* when the bolts are of copper instead of iron in that part immersed in the water. When these bolts are of iron, galvanic action is set up between the bolts and the copper sheathing.

Coppers. The ship's boilers for cooking; the name is used even when the boilers are made of other material than copper, which is now the case. *Hot coppers* is a term used to denote a state of extreme thirst, particularly when it is the consequence of a debauch.

Corab. A sort of boat, otherwise called *coracle*.

Coracle. An ancient British truckle or boat, constructed of wicker-work, and still in use among Welsh fishermen and on the Irish lakes. It is covered by skins, oil-cloth, etc., which are removed when out of use; it is of an oval form, and contains one man, who, on reaching the shore, shoulders his coracle, deposits it in safety, and covers it with dried rushes or heather. The Arctic *baidar* is of similar construction. It is probably of the like primitive fabric with the *cymba sutiles* of Herodotus.

Coracora. See KORACORA.

Coral. A name applied to the hard calcareous support or skeleton of many species of marine zoöphytes. The coral-producing animals abound chiefly in tropical seas, sometimes forming, by the aggregated growth of countless generations, reefs, barriers, and islands of vast extent. The "red coral" (*Corallium rubrum*) of the Mediterranean is highly prized for ornamental purposes.

Coralan. A small open boat for the Mediterranean coral-fishery.

Cor Caroli (Lat. "Charles' Heart"). See CANES VENATICI.

Cordage. A general term for the ropes on board ship. See ROPE.

Cordilla. The coarse German hemp, otherwise called *torse.*

Cordlie. A name for the tunny fish.

Cordovan. Leather made from seal-skin; the term is derived from the superior leather prepared at Cordova in Spain.

Core. The internal mold which forms a hollow in casting, as in a gun. The insulated wire of a submarine cable.

Cor Hydræ. *α Hydræ,* called also Alphard. See HYDRA.

Cork. A city and river port of Ireland, capital of the county of Cork, on the Lee, 11 miles above the entrance of Cork harbor, and 137 miles S.W. of Dublin. The city proper is built on an island formed by the Lee, which river is crossed by bridges. Cork communicates by steam with London, Dublin, Bristol, Liverpool, and Glasgow. Pop. 79,000.

Corkir, or Cudbear. The *Lecanora tartarea,* a lichen producing a purple dye, growing on the stones of the Western Isles and in Norway.

Cor Leonis. *α Leonis,* called also Regulus. See LEO.

Cormorant. A well-known sea-bird (*Phalacrocorax carbo*) of the family *Pelecanidæ.*

Corned Powder. Powder granulated from the mill-cakes and sifted.

CORNS OF POWDER. Small grains of powder.

Coromontine. A tribe of negroes in the interior of Africa. They are very ferocious, and when sold into slavery prove very troublesome to their masters.

Corona. A peculiar phase of the *aurora borealis.* A circle around the moon during a total eclipse of the sun. Frequently when there is a halo encircling the moon, there is a small corona more immediately around it.

Corona Australis. See CONSTELLATION.

Corona Borealis (Lat. "The Northern Crown"). A constellation lying between *α Lyræ* and Arcturus. *α Coronæ Borealis,* Alphecca.

Corouse. The ancient weapon invented by Duilius for boarding. An attempt was made in 1798 to re-introduce it in French privateers.

Corphoun. A name for the herring.

Corporal. A non-commissioned officer of marines, next in rank to a sergeant.

CORPORAL, LANCE. A private marine doing the duty of a corporal.

CORPORAL, SHIP'S. A petty officer to assist the master-at-arms in his various duties. See MASTER-AT-ARMS.

Corposant. See ST. ELMO'S FIRE.

Corps. A body of officers, or officers and men; as, the medical corps, the marine corps, etc.

Corpse. Jack's term for the marine guard,—the corps.

Correction. An allowance made for inaccuracy in an instrument; as, compass correction, chronometer correction, etc.

Corryne-powder. Corn-powder, a fine kind of gunpowder.

Corsair. A pirate, or piratical vessel. The term was applied more particularly to the piratical cruisers of Algiers, Tunis, and Tripoli.

Cor Scorpionis. *α Scorpionis,* called also Antares. See SCORPIO.

Cortez, Fernando. The history of Spanish discoveries on the continent of America reveals few names of greater celebrity than the discoverer and conqueror of Mexico. Accompanying Velasquez on his expedition to Cuba, he recommended himself by his talents and courage to his chief, who deputed him to visit the western coast and establish colonies. In February, 1519, Cortez coasted the peninsula of Yucatan, and stopping at San Juan de Ulloa, received information which led him at once to found a settlement at Vera Cruz and proceed to the court of Montezuma. Ultimately he conquered the whole kingdom of Mexico, and giving it the name of New Spain, annexed it to the Spanish crown. Not realizing the recompense he expected, he abandoned his views in respect to the military government of the new possession, and proceeded on an exploratory voyage northerly. In 1536 he discovered the peninsula of California, and surveyed a part of the gulf which separates it from the American continent. But reaping neither profit nor honor, excepting as a geographical discoverer, he returned to Spain in 1540 to die in seclusion, after serving Charles V. against the Algerians.

Corunna, a fortified city of Spain, capital of the province of Corunna, is situated on a bay of the Atlantic, 320 miles N.W. of Madrid. Lat. 43° 22′ 5″ N.; lon. 8° 22′ 7″ W. Its harbor is safe, and defended on the east by Fort San Diego and west by Fort San Antonio. A great part of its population is employed in the herring- and pilchard-fishery. Some ship-building is carried on, and there is a school of navigation. Pop. 30,000.

Corvette. (Lat. *corbita;* Sp. *corbeta;* Fr. *courvette, corvette*). A name common in the French navy, in the days of wooden ships, to a class of vessels of war ranking, in military value, next after the frigate, to which, in rig and general appearance, they bore a resemblance. The equivalent in the English navy was a "Jack-Ass" frigate; but in the navy of the United States the general term sloop-of-war is applied to all vessels between a frigate and a brig. The French corvette of the first class had a covered battery and carried guns on the forecastle and quarter-deck. The razeed frigates of the "Cumberland" class were our nearest approach to the heavier French corvettes. Thirty years ago, the battery of a French corvette, *à batterie couverte et à galliards armés,* varied from 20 to 32 guns; that of a *corvette à batterie barbette* (single-decked sloop-of-war) varied from 14 to 24 guns.

The term *corvette* comes from *corbita,* a basket, the sign worn at the mast-heads of the Egyptian grain-ships as the symbol of their trade. This gave the name to a class of vessels, originally vessels of burden (*naves onerariæ*). In time the name came to be applied to a light and fast galley of one mast, and propelled by both sails and oars. The name occurs in the history of the Italian navies of the middle ages. It made its appearance in the French navy about the year 1687. The *corvette* was then used, on account of its lightness and speed, as a look-out ship attached to a fleet, and for carrying dispatches.

Corvette-aviso, a light, fast sloop-of-war used in more modern times as a dispatch-vessel. The name has sometimes been applied, in the French navy, to a certain class of brigs-of-war.

Corvette de charge, a store-vessel, or transport.

The term *corvette* has never been adopted in the United States navy.—*S. B. Luce, Captain U.S.N.*

Corvus (Lat. "The Crow"). *a Corvi*, Alchiba.

Cosier. A lubber; a botcher.

Cosmical. Rising and setting with the sun; the opposite of achronical.

Coss. An East Indian measure of distance, varying from one to one and a half miles.

Costal. Relating to the coast.

Cot. A wooden frame inclosed in canvas, and suspended from the beams; it is used as a sleeping-place by invalids, and sometimes by officers.

Cote, or Cot. An old term for a small boat.

Cotter, Cutter, or Key. In machinery, a wedge-shaped piece of metal, usually steel, used for adjusting and confining bearings to journals. It is generally secured in position by a screw.

Cotton, Gun-. See EXPLOSIVES.

Cottonina. The heavy canvas used for sails in the Levant.

Coubais. An ornamental Japanese barge of 40 oars.

Coud. An old word for *conn.*

Coulter-neb. A name of the puffin (*Fratercula arctica*).

Counter. The portion of a ship from the water-line to the knuckle of the stern.

COUNTER-RAIL. The ornamental rails across the stern into which the counters finish.

COUNTER-TIMBERS. Timbers worked on each side of the stern-post in all round and elliptical sterned ships to form the rake and contour of the stern.

Counter-brace. The lee fore-topsail brace is so called during the operation of tacking, from its being hauled in, after the sails catch aback, to flatten the sail against the lee side of the topmast, and thus increase the effect of the wind in forcing the ship's head around. *To counterbrace the yards* is to brace the head-yards up one way and the after-yards the other. The yards are counter-braced while at anchor to diminish the force of the wind acting on them; they are sometimes counter-braced in a calm to be in readiness to take advantage of any breeze that may spring up; they are counter-braced while under way to check the headway or to heave-to.

Counter-current. A current running in the opposite direction to the main current.

Countermand. To revoke, as a former command; to annul, or prohibit the execution of, a previous order.

Counter-mold. When a piece of timber molded on both sides as a breasthook, is intended to come to its place accurately, the following operation is gone through with:

After one edge, say the upper one, is accurately shaped to the mold, the bevelings are taken square from the piece and applied directly to the part to which the breasthook is to be fayed. Then the counter-mold is laid upon the piece to fit the spots which have been found after the bevels and square spots have been produced upon the other face of the breasthook to be counter-molded; they agreeing, the piece may be confidently trimmed through to the first molding-edge.

Counter-sea. A sea running in an opposite direction from the wind.

Countersign. A private word or phrase which is given out by the commanding officer of the marines at a navy-yard; every one who enters the yard between tattoo and reveille is required to give the countersign at the gate, and to every sentry by whom he may be challenged. See PAROLE.

Countersunk. Sunk so as to be even with or below the surface; as, a countersunk bolt.

Country. That portion of an apartment on board ship which is used in common by all the officers of the same mess; as, the wardroom country, or that portion of the wardroom between the two rows of state-rooms.

Coup d'œil. That talent of quick observation by which a person by a single glance at the situation of affairs detects its strong and weak points, and is thereby enabled to manœuvre to the best advantage.

Coup de grace. A decisive finishing stroke.

Coup de main. A sudden attack or enterprise.

Coupling. In mechanism, any device for joining separate parts together so that they may be easily disconnected, such as sections of shafting, piping, or hose. The coupling of shafting is accomplished by the use of flanges, either wrought or cast upon the shaft or rigidly attached thereto, secured by bolts and keys. Large pipes are coupled by flanges and bolts; small ones by screw couplings called "union couplings." Sections of hose are connected by screw couplings. In cases where instantaneous coupling or uncoupling is required, the "clutch" or "friction coupling" is used. In these arrangements one flange is free to slide in the direction of the axis of the shaft, but by means of "feathers" rigidly compelled to turn with it, the sliding motion being controlled by levers. In the clutch the faces of the flanges have interlocking projections; in the friction coupling two accurately fitted conical faces are forced together.

Coureau. A small yawl of the Garonne. Also, a narrow strait or channel.

Course. The angle which a ship's track makes with the meridians, this angle being referred either to the true meridian or to the position of the magnetic needle by which the ship is steered. The former is the *true* course, the latter the *compass* course. To obtain the true course, the course steered must be corrected for leeway and for the variation and deviation of the compass. The course *made good* is the bearing of the position *in* from the position *left.*

Courses. The sails which are bent to the lower yards; the fore, main, and mizzen staysails are sometimes comprehended under this term.

Courset. The paper on which the night's course was set, as a memorandum for the officer of the watch. See NIGHT ORDERS.

Coursey. A space in the galley; a part of the hatches.

Court-martial, *n.*; *pl.* Courts-martial; pro. cort-mar′-shal. A tribunal composed of military or naval officers appointed for the trial of offenders against military or naval laws.

Derivation.—COURT, from O. Fr. *court* or *cort*, and N. Fr. *cour*, from Latin *chors*, *chortis*, and *cohors*, *cohortis*, meaning an inclosure, court, crowd, or throng. MARTIAL, from Lat. *martialis*, from *Mars*, the god of war: hence pertaining to war; suited to war; military.

The word court, *curia*, in its law sense, means the place where justice is judicially administered, and as well the assemblage of judges, jury, *et al.*; and this employment of the word, which in its primitive and restricted sense meant "an inclosure without a roof," and then "a palace, or residence of a king," is evidently attributable to the fact that in ancient times the king, as chief magistrate or ruler, was regarded as the fountain of justice, and sometimes the dispenser, sitting in person as late as Edward IV. to hear and determine causes. The palace used for this purpose became known as "the court," which gradually grew to denote also the assembly.

History.—The court-martial of to-day appears to be the offspring and heir of the old *Curia Militaris*, or Court of Chivalry, called also the Marshal's Court, which at one time was the only military court established by the laws of England. In the beginning it was held before the lord high constable and earl marshal jointly, but after the attainder of Stafford, Duke of Buckingham, in the reign of Henry VIII., and the consequent extinction of the office of lord high constable, it was, with respect to civil matters, held before the earl marshal only. This court, by statute (13 Richard II., c. 2), had cognizance of "contracts and other matters touching deeds of arms and war," as well out of the realm as within it, and was in great reputation in the times of pure chivalry, and later, during England's connection with the continent by her territories in France. It was a *military* court, or court of honor, when held before the earl marshal only, and also a criminal court when held before the lord high constable; but both of these parts of its authority had fallen into disuse early in the present century, on account of the feebleness of its jurisdiction and want of power to enforce its judgments. Not being a court of record, it could neither fine nor imprison, and an appeal from its sentence had to be made immediately to the king in person.

The modern form of military courts was adopted by ordinance in the time of Charles I., when English soldiers were studying the Articles of War of Gustavus Adolphus, and is first recognized by statute in the original Mutiny Act, 1689 (1 William and Mary, c. 5).* By this act, annually renewed "for the regulation of the army," the sovereign is authorized to grant from time to time "a commission, under his royal sign-manual, to any officer not under the degree of a field-officer for holding a general court-martial." He could also extend by warrant to the lord lieutenant of Ireland, the governor of Gibraltar, or of any of "the dominions beyond the seas," authority to appoint courts-martial. Although nearly two hundred years have passed since this enactment, it remains the fountain of military law; many of its provisions are in force unchanged, and nearly all have been adopted in modified form into the codes of this country. The student will discover many interesting similarities by recurring to its text.

Naval law, and military law proper, seem always to have possessed wider points of difference than the varying circumstances call for. The early naval law of England, which is styled "barbarous," was long intrusted for its administration to the discretion of commanders acting under instructions from the Lord High Admiral, who was supreme over both the royal and merchant navy.

In 1645 the leaders of the Long Parliament secured something like a regular tribunal by passing "An Ordinance and Articles of Martial Law for the Government of the Navy." Under this authority "general and ship courts-martial with written records" were established; the one for captains and commanders, and the others for subordinate officers and men. Of the latter, the mates, gunners, and boatswains could be members, but the admirals reserved control over the more serious offenses. A later law (Act 13, Charles II., c. 9) again gave the Lord High Admiral power to issue commissions to hold courts-martial, which power continues to be exercised by the Board of Admiralty. The court of the High Admiral had civil jurisdiction in all maritime causes, and in criminal cases to all crimes committed upon the seas, on fresh water "within flood-mark," and in all harbors, creeks, etc.

In 1749, through the exertions of Anson, a very stringent act was passed, in which the death penalty was affixed to a multitude of offenses,—a circumstance which no doubt accounts for its frequent occurrence to-day in our naval code, though most rarely imposed; so rarely, indeed, that a yard from which a culprit has been hanged becomes historical, and is followed, in memory, from ship to navy-yard and from navy-yard to ship by the sailors of the service.

Administration.—The important matter of administering law and justice by means of courts-martial in the U. S. navy has until recently been lamely and imperfectly conducted. There is still lacking a corps of trained judge-advocates, such as is possessed by the army, and it has happened that the dignity and efficiency of a court, and the character and value of the very essential office of judge-advocate, have all been belittled by the appointment to the latter duty of officers unwilling and wofully incompetent. There was also a scarcity of applicable knowledge, properly systematized and arranged, both as to learned treatises and manuals. Until 1846, except a small book by Major-General Macomb, U.S.A., there was no strictly American authority on courts-martial. In that year Captain Wm. C. De Hart, 2d U. S. Art., published a work on "Military Law adapted to the United States Army and Navy," which contained much of value and is still quoted.

Books of foreign origin, generally English, were previously employed, and the practice of our courts-martial was often both inconsistent and contradictory. Errors were frequent; there was no settled and uniform interpretation of either the law or the mode of procedure, and hence proceedings were often disapproved and set aside for informalities and omissions. The requirements of parliamentary enactments were confused with the general principles of law, and, to increase the difficulties, our own statutes, for unfathomable reasons, prescribed differences in practice and power between courts of the army and navy of the same degree and jurisdiction, as to rank and offense, some of which still exist. Captain De Hart's book, as well as that of Cap-

* Occasioned by a mutiny in a body of English and Scotch dragoons and infantry ordered to Holland to replace some Dutch troops transferred to England.

tain (now Brigadier-General) S. V. Benét, which followed, were more especially for the use of the army, and naval officers were left to apply their contents as their best intelligence might direct. This did not tend to lessen much the want of uniformity of action, although the books did great good in other ways. Perceiving the necessity for a concise compilation of the laws, regulations, and customs "distinctly naval," Rear-Admiral A. A. Harwood, U.S.N., prepared (1867) the book which bears his name, and it is now a generally accepted authority as to the administration of law in the navy.

Constitution and Organization.—The power "to make rules for the government of the land and naval forces" is vested in Congress by the Constitution (Art. 1, Sec. 8) and the Revised Statutes (Sec. 1624), and the acts passed subsequent to December 1, 1873, are "the laws which define the powers and duties, and regulate the organization and mode of procedure" of naval courts and boards.* To the mandates of these laws are to be added a portion of the Navy Regulations (1876), parts of a Manual for the Administration of Law and Justice, issued by the Navy Department (1870), and such orders, regulations, and instructions as the Secretary of the Navy has adopted, "with the approval of the President," subject to alterations adopted in the same manner, all of which have been given the force of law (Rev. Stat., Sec. 1547), with penalty in case of failure to obey. (*Ibid.*, Art. 8 of Sec. 1624.) No court-martial can be constituted or can claim jurisdiction except in direct accordance with these laws.

By them courts-martial of two kinds are authorized, viz., general and summary. The first is for the trial of offenses committed by "any person in the naval service,"† and may be convened as often as the President of the United States, the Secretary of the Navy, or commander-in-chief of a fleet or squadron shall deem it necessary; but, in the waters of the United States, no commander-in-chief shall convene such court-martial "without express authority from the President." It is the highest naval judicial authority, and must consist of not less than five nor more than thirteen commissioned officers as members; "and as many officers, not exceeding thirteen, as can be convened without injury to the service, shall be summoned on every such court." In no case, where it can be avoided without injury to the service, shall more than one-half, exclusive of the president, be junior to the officer to be tried. The convening authority has full and final discretion as to what would cause injury to the service.

The number and rank of the officers selected is usually governed by the grade of the offender and the gravity of the offense. A full court of thirteen officers is very seldom convened. Seven and nine are the most frequent numbers. In the British navy the legal maximum, formerly thirteen, was, in 1868, reduced to nine; the minimum remaining the same,—five. Custom prescribes in any case an odd number upon organization; but, if the original detail be reduced by sickness, detachment, or casualty pending a trial, the court continues its labors, unless otherwise directed, until fewer than five assemble. Should the circumstances of a case demand a court of thirteen to be assembled and maintained, it is customary to detail supernumerary officers, necessarily juniors, to fill vacancies which may exist upon organization or occur later.

The mode of convening a court is by a written or printed order, or precept, addressed to the senior officer named in the detail, who presides by virtue of his rank. The precept recites the authority by which it issues; fixes the day, hour, and place of assembly; states who is to be tried; and names the officers who are to compose the court in the order of their rank. The person who is to act as judge-advocate is also named, and the whole is signed by the officer ordering the court, with his rank and title. A separate written appointment, which is also an order to report to the presiding officer of the court, is sent to each member and to the judge-advocate. All commissioned officers on the active list are eligible to membership, but subject to challenge by both the accused and the judge-advocate. The latter, having no vote, cannot be challenged. If an officer of the medical, pay, marine, or engineer corps is to be tried, it is deemed proper, if the exigencies of the service will permit, that at least one-third of the court shall be composed of officers of the same corps. When thus associated on courts or boards, line and staff officers take precedence according to rank, and wear the service-dress uniform, without swords, unless otherwise specially directed. (N. Reg., 1876.) Other officers attending courts-martial as witnesses or in any capacity wear the same. Formerly the full-dress uniform (cocked hat, epaulets, and sword) was customary, and a court-martial was an affair of much state, and great discomfort. Judge-advocates are appointed by the Secretary of the Navy only (see JUDGE-ADVOCATE), and provost-marshals by the president of the court. See PROVOST-MARSHAL.

At the time and place appointed the officers assemble, and present their orders to the presiding officer, who indorses them "Reported," adding the date and signing officially. He takes his seat at one end of a long table prepared for the use of the court, and assigns the others their seats according to rank, the first on his right, the second on his left, and so on alternating to the junior. The judge-advocate sits at the opposite end, and the accused, who has previously been placed in arrest or confinement, is introduced unfettered, unless violent, or escape be apprehended, and sits on his right, where a small table is placed for the use of himself and counsel. A chair is placed on the left of the judge-advocate for witnesses, and others are furnished for spectators, all courts-martial being public except when cleared for deliberation.

The order convening the court and the appointment of the judge-advocate are then read aloud to the accused, standing, by the judge-advocate, who asks if he objects to any officer named in

* The army and navy are governed by separate and special laws as distinct communities, the code of the former being known as "The Articles of War," originally 101 in number, approved April 10, 1806; and that of the latter as "The Articles for the Better Government of the Navy," originally 25 in number (now 60), approved July 17, 1862, and all incorporated in the Revised Statutes. The first rules for the regulation of the navy were established by a resolution of Congress, November 28, 1775. These were succeeded, March 2, 1779, by a very complete code of 50 articles, many of which continue operative.

† This includes members of the marine corps, except when serving with the army by order of the President. (Rev. Stat., Sec. 1621.)

the order sitting on his trial. If yea, the objection is recorded, and the challenged party withdraws until the objection is considered. Should the accused demand it, the member may be put upon his *voir dire*, the oath being administered by the judge-advocate. Personal interest in the case, prejudice, animosity, an expression of opinion for or against, having been a member of a court of inquiry to investigate the charges, or having preferred the charges, are good grounds for challenge. All objections having been acted upon, the oaths, or affirmations, prescribed by law are administered in the presence of the accused. *First*, by the presiding officer to the judge-advocate; *second*, by the judge-advocate to the members of the court (see OATHS), and the fact so recorded. Failure to do this as thus described would be a fatal defect. While the court is being sworn all in the room stand, and the utmost silence prevails. Each member who does not elect to affirm places his right hand, ungloved, on the Holy Bible, and the judge-advocate, holding the book, and addressing each by name, reads the oath. The president then "kisses the book," as does each in turn, according to rank, passing it along. All are sworn to secrecy as to the sentence and the vote or opinion of any particular member; also to try the case depending impartially.

Jurisdiction, Powers, and Duties.—The court is now organized, and has a special jurisdiction co-extensive with the face of the earth; that is, for an offense committed in Brazil, for instance, the offender may be tried by a court convened in Massachusetts, or in the waters of Africa. This special jurisdiction embraces all naval persons of whatever condition, during the period of their obligation to serve, and in some cases longer, and all crimes or acts set forth in the laws and regulations for the navy, or which, if not specified, may be prejudicial to good order and discipline. Citizens, as a general rule, are not amenable, although they may become so under certain circumstances. A court-martial has no power to award pecuniary damages for injurious conduct. Its jurisdiction is criminal, and its judgments are penal. Bail is unknown. Any person who refuses to give evidence, or prevaricates, or behaves with contempt to the court, may be imprisoned by the court not to exceed two months; and for the crime of perjury, or subornation of perjury, may be prosecuted in any court of justice in the United States. All offenses committed while on shore are punishable in the same manner as if committed at sea. General courts only are competent to try capital offenses and commissioned officers, and to compel the attendance of witnesses who are subject to the authority of the United States.

Every accused person is entitled to a true copy of the charge and specification alleged against him, properly authenticated, at least twenty-four hours before he is brought to trial; and should he desire counsel, a stenographer, or a friend to assist in his defense, they are admitted and mentioned in the record. He is also entitled to a list of the witnesses who are to appear against him, and to have such witnesses summoned as are material to his defense. See WITNESS.

If the charges are found to be correct, and the accused is prepared for trial, they are read to him, and he is called upon to plead "Guilty" or "Not Guilty." Should he plead not guilty, or stand mute, testimony is taken. The judge-advocate summons the witnesses, and the president administers the oath to them "in the presence of the accused." (See OATHS.) They are examined first by the party calling them, then cross-examined by the opposite party, and, finally, the court puts such questions as it may consider necessary. All questions and answers must be recorded in full, and the evidence of each witness be read to him and be pronounced by him correct before he is discharged. The laws of evidence which obtain in civil courts are adhered to in the main, but the "numberless niceties" and minute distinctions are not always regarded.

The proceedings having commenced, the court is required by law to sit from day to day, Sundays excepted, until sentence is given, unless temporarily adjourned by the authority which convened it; and no member can absent himself "except in case of sickness, or of an order to go on duty from a superior officer, on pain of being cashiered." Testimony taken during the absence of a member must be read to him when he returns, and acknowledged correct by the witness, before he can resume his seat in that particular case. The president, as the organ of the court, is empowered to preserve order and decorum, to speak and act for the court in all cases provided for by law, custom, or its own resolution, and requires all persons called before it to be treated in a becoming manner. In all deliberations *the members are equal;* all questions are decided by a majority vote, the junior voting first; and the members are individually and collectively responsible to the civil judicature for any abuse of power, illegal or corrupt proceeding. A court has no power to punish its own members, and for disorderly conduct one is liable as in other offenses against the discipline of the service.

The prosecution is formally closed before the defense begins, and all orders, motions, votes, or rulings of the court, except its discussions, and all motions, propositions, arguments, or statements of the accused or judge-advocate,—in short, every fact necessary to a complete history of the case and a correct understanding by the reviewing authority, is recorded. Upon completion of the evidence the accused is allowed time to prepare and submit his written defense, to which the judge-advocate has the right to reply.

The court is then cleared for deliberation, and after deciding upon its *finding*, or verdict, adjudges sentence, in each case by ballot. The court can find guilty in a less degree than charged, but in all cases of conviction must adjudge punishment adequate to the offense. Every member must vote upon a sentence whether he believes the accused guilty or not. A sentence of death requires the concurrence of two-thirds of the members present, but all others may be determined by a majority of votes. The discretion of a naval court-martial as to punishment is very great, only "flogging, branding, marking, or tattooing on the body" being prohibited by law. Shaving the head, drumming out of the service, extra guard duty, and ball and chain, though lawful, have within the last fifteen years grown into disfavor and are nearly obsolete. Courts-martial have no power to par-

don or mitigate, but the members can recommend a convicted person to clemency.

The record and judgment of the court, after being signed by all of the members present and the judge-advocate, is sent to the officer who convened it for review. He has authority to send it back for revision and amendment, if needed, or can approve or disapprove it, remit or mitigate, but not commute, the sentence. He can also execute any sentence which does not extend to loss of life, or the dismissal of a commissioned or warrant officer, which must be submitted to the President. All proceedings are now (1880) required to be sent direct to the judge-advocate-general of the navy to be revised, reported upon, and filed. See JUDGE-ADVOCATE-GENERAL.

No court can terminate its own existence; therefore, when the record is passed upon and the action of the reviewing authority written upon it, an order is addressed to the presiding officer dissolving the court. Another order may also issue announcing to the service the result of the trial. Since February 4, 1879, the Navy Department has published a regular series of "court-martial orders" promulgating trials by general courts, which are of much value as a means of discipline and for reference.

Decisions.—An officer detailed on a court or board of any kind is excused from other duty while so serving. An officer promoted while on a court gives public notice thereof to the court, and the fact is noted in the record. The convening authority may direct the judge-advocate to enter a *nolle prosequi* at any time after trial has commenced. A mere withdrawal of charges does not prevent them from being again preferred. The power to remit is the same as that to pardon, and is co-ordinate with that to execute. It is essential to the validity of a pardon that it should be accepted. (See PARDONING POWER.) A crime committed during desertion is cognizable by a court-martial. An adjournment *sine die* does not prevent a court from reassembling.

Exalted rank gives no additional latitude or privilege,—all prisoners are equal before the law. The administration of justice ceases to be pure when not strictly impartial. "Where the proper reviewing officer has confirmed the sentence of a competent court-martial, of which the proceedings were regular, and has dissolved the court, the judgment is final; no appeal can be taken from it, or new trial ordered by the President." Relief must be found in pardon.—*Henry C. Cochrane, Captain U.S.M.C.*

Court-martial, Summary. "Summary courts-martial were established for the trial in the navy of such lesser offenses as the commanders of vessels may deem deserving of greater punishment than they are by law authorized to inflict upon petty officers and persons of inferior rating under their command, but not sufficient to require trial by general court-martial." They have no power to try commissioned or warrant officers, nor any offense the proper punishment of which, in case of conviction, would be more severe than they are authorized to impose. Notwithstanding this plain provision, commanders of vessels have been known to disregard it and to refer to summary courts "the grave offense of desertion," for instance, which at the hands of a general court seldom receives less than one year's imprisonment with loss of pay. A summary court-martial cannot adjudge more than two months of confinement.

An act to provide a more efficient discipline for the navy, approved March 2, 1855, gave them being, and a subsequent enactment (1870) extended to commandants of navy-yards, naval stations, and marine barracks the authority to convene them. The person to be tried must belong to the command of the officer who orders the court, and the court must consist of three officers, not below the rank of ensign, as members, and a recorder, who may be any officer of the command. The court is convened by a brief written order addressed to the senior member, who presides, stating the detail and the time and place of meeting, and by verbal orders to the other members and the recorder. Where a person belonging to the marine corps is to be tried, one or more marine officers are to be on the court if possible.

Before proceeding to trial, the recorder administers an oath to the members to try the case without prejudice or partiality, and the senior member swears the recorder to keep a true record of the proceedings. (See OATHS.) All testimony is given orally upon oath or affirmation administered by the senior member. A schedule of seven punishments is prescribed, any one of which may be inflicted, and to it may be added "extra police duties and loss of pay not to exceed three months." A summary court may also disrate any rated person for incompetency. Sentences are not executed until approved by the officer ordering the court, and by the commander-in-chief or senior officer present, and a sentence involving "loss of pay" must be referred to the Secretary of the Navy. Sentences can be remitted in part or altogether, but cannot be commuted, and where, in the opinion (in writing) of the senior medical officer of the command, the execution of a sentence would seriously injure the health of a prisoner, the case can be submitted again without delay to the same or another court, which can, upon the testimony already taken, change the punishment to some other of those authorized.

The proceedings are to be conducted with as much conciseness and precision as may be consistent with the ends of justice, and under forms and rules prescribed by the Secretary of the Navy, with the approval of the President. Summary courts are required to follow the same forms of procedure and rules of evidence as are observed by general courts, so far as applicable, and their proceedings must be transmitted to the Navy Department. The court is dissolved by the authority which ordered it to convene. No statistics of summary courts are available, but it is known that in some commands they are very frequent, and in others of rare occurrence, depending almost entirely upon the judgment or caprice of commanding officers. Judiciously employed, they are undoubtedly valuable adjuncts of discipline.—*Henry C. Cochrane, Captain U.S.M.C.*

Cove. An inlet in a coast; a recess in the seashore; a shelter, a cover.

The arch molding sunk in at the lower part of the taffrail. *My cove*, a familiar friendly term.

Coventry. *To send to coventry*, to ostracize; to banish from society; to cut off from social intercourse for a mean or ungentlemanly action.

Cover. Anything that is spread above or about another; as, a boom-cover, wheel-cover, etc. *Under cover*, sheltered from the elements or from the fire of an enemy. *To cover*, to protect, defend, or support; as, to cover a retreat, or a boarding-party.

COVERING-BOARD. A term used in the building of schooners and fishing-vessels. It is the water-way and plank-sheer combined in one piece of timber, and covers both the inner and outer planking, the stanchions cutting through these pieces of timber. It is sometimes called the "plank-sheer."

Cow. The female whale. *To cow*, to depress with fear.

Cowan. A fishing-boat of Scotland.

Cow-hitch. A slippery or lubberly hitch. Two half-hitches in which the end parts come out parallel and in the same direction; used for securing the hauling part of the laniards of lower and topmast rigging.

Cowhorn. Jack's name for the coehorn.

Cowie. A Scotch name for the porpoise.

Cowl. The cover of a funnel.

Cowrie. Small shells, *Cypræa moneta*, used for money or barter in Africa and the East Indies.

Cox's Traverse. Up one hatchway and down another, to elude duty. See TOM COX.

Coxswain, or Cockswain. Derived from *cock*, a small boat, and *swân*, a swain or servant. A person who has charge of a boat and crew in the absence of officers. In double-banked boats he steers, but in single-banked boats he pulls the stroke oar, the boat being generally fitted with a yoke and steered by an officer.

COXSWAIN'S-BOX. The space comprised between the back-board and the stern of a boat.

Crab. A species of windlass or capstan. An animal of the class *Crustacea*, having the body covered with a shell called the carapax. *To crab*, to drift sideways; to make a great deal of leeway; from the peculiar motion of a crab. *To catch a crab*, see CATCH.

Crabbe, Thomas, Rear-Admiral U.S.N. Born in Maryland. Appointed midshipman from Pennsylvania, November 15, 1809. Engaged in an attack by a squadron of gunboats on three British frigates in Hampton Roads, June 20, 1813; also in repelling an attack made on Craney Island by the British forces, under command of Sir Sidney Beckwith and Admiral Cockburn, June 22, 1813.

Commissioned as lieutenant, February 4, 1815.

Commissioned as commander, March 3, 1835. Commanding sloop-of-war "Vandalia," West India Squadron, 1836–37. While in command of the "Vandalia," Fort Brook, Tampa Bay was given in charge of the navy for defense, in the absence of the army operating in the interior against the Seminole Indians. Commander Crabbe received the following commendatory letter from Gen. Jessup on this occasion:

"In dissolving the official relations in which we have stood to each other, so much to my satisfaction, for several months past, I cannot avoid the expression of the great obligations I am under to you and your command for the uniform, steady, and efficient support which you have at all times given to me,—a support most auspicious in its effects upon the results of the campaign, and which I shall always remember with the liveliest gratitude."

Commissioned as captain, September 8, 1841. Ordered to command frigate "Brandywine," Brazil Squadron. Commander of steam-sloop "San Jacinto," Mediterranean Squadron, 1852–53. Commander Crabbe served in the frigates "President," "Constellation," "United States," and "Java," line-of-battle ship "Delaware," sloop-of-war "Peacock." Commanded squadron on coast of Africa, in flag-ship "Jamestown," 1855–57.

Commissioned as commodore, July 16, 1862. Prize Commissioner, Eastern District Pennsylvania, 1864–65.

Commissioned as rear-admiral, July 25, 1866. Died in 1873.

Crabbler. See KRABLA.

Crack. Of superior excellence; as, a crack ship. *To crack on*, to carry a press of sail.

Crack-brained. Having a defective intellect.

Crack-hemp, or Crack-rope. A wretch destined to be hanged.

Cradle. The framing which is built upon the launching-ways, in which the ship rests as in a cradle, while in the process of launching. Supports for boats carried on the rail.

Craft (Ang. Sax. *cræft*, a trading-vessel). A general term for all kinds of vessels. *Small craft*, small vessels.

Crag. A rugged precipitous rock or cliff, whose strata, if vertical, subdivide into points.

Crager. An old name for a small lighter.

Craig-flook. The smear-dab, or rock-flounder.

Cramp. A spasmodic contraction of the muscles, frequently experienced in bathing or swimming.

CRAMPER. A yarn worn around the leg as a preventive of cramp.

Cramp-fish. The torpedo, or electric ray, the touch of which gives a light shock of electricity.

Crampings. The fetters of a prisoner.

Crampit. The piece of metal at the tip of a sword-scabbard.

Crampoon. See CREEPER.

Crance. A boom-iron.

Crane, William Montgomery, Commodore U.S.N. Born at Elizabethtown, N. J., February 1, 1784; died at Washington, March 18, 1846. His father, General William, severely wounded at Quebec, and a colonel in the Revolutionary army, died at Elizabethtown, July 30, 1814. Midshipman, May 23, 1799; lieutenant, July 20, 1803; commander, March 4, 1813; captain, November 22, 1814. Commanding the brig "Vixen," he distinguished himself in the attack on Tripoli, and was in the "Chesapeake" when attacked by the "Leopard." In July, 1812, while commanding the brig "Nautilus," he was taken by the "Southampton" frigate. On his exchange he was ordered to the lakes, where, in command of the "Madison" and "Pike" in Chauncey's squadron, he served with distinction for the remainder of the war. In 1827, in the flag-ship "Delaware," he commanded the Mediterranean Squadron, acting as joint commissioner with Mr. Offley, U. S. consul at Smyrna, to open negotiations with the Ottoman government. Appointed Navy Commissioner in 1841, and in 1842 chief of the Bureau

of Ordnance and Hydrography. He died by his own hand; cause unknown.

Crane. A machine for raising or lowering great weights, and, while holding them in suspension, transporting them through a limited horizontal distance. In its primitive form it consists essentially of an upright post, pivoted so as to swing freely on its vertical axis; a horizontal arm or "jib" projecting from the top of the post and strongly braced from near the bottom by a diagonal brace, and to which the pulleys and weights are suspended; pulleys rove with rope, wire-rope, or chain; a winding barrel for the rope or chain, and guys for controlling the horizontal position of the weight. The upper pulley may, by means of a "traveler," be moved to any desired position on the arm or "jib." Modern cranes are very elaborate in structure, and enable weights to be placed in position with great accuracy. Derricks are modifications of the crane.

CRANAGE. The liberty of using, and the money paid for using, a crane.

CRANE-BARGE. A low flat-floored boat fitted with a crane, for raising anchors, etc.

Crane-line (*Obs.*). A line from the spritsail topmast to the forestay to steady the former; also, a line to keep a lee backstay from chafing against the yards when braced sharp up.

Crang. The carcass of a whale after the blubber is stripped off.

Crank. In machinery, the simplest and most efficient device for transmitting a reciprocating rectilinear movement to a rotary motion. It was patented in the year 1780 by Mr. Pickard, of Birmingham, England, as "a method of deriving a rotary motion from a fire-engine by the intervention of a crank," but was rejected by the leading engineers of that day, including Boulton and Watt, on the ground that it caused great loss in economic effect; but it shortly superseded the famous "sun-and-planet motion" of Watt, and all "ratchet" devices, and is now familiar to all.

The theory of its action, showing that there is no loss in the transmission of power, may, by neglecting friction, including that due to the oblique action of the connecting-rod, and which is about equal in all combinations, be represented as follows:

Let L represent the length of stroke of piston;

r the length of the crank $= \frac{1}{2} L$;

p the total pressure on the piston;

p_1 the resultant force of p at right angles to crank;

θ any angular motion of the crank;

w work done during an infinitely small motion of crank;

W the amount of work done during one stroke.

Then the tangential moment tending to turn the crank may be represented by

$$p_1 = pr \sin \theta \quad . \quad . \quad . \quad (1)$$

and the work done through an infinitely small change in position by

$$w = p_1 d\theta = pr \sin \theta d\theta \quad . \quad (2)$$

This, if integrated between the limits $\theta = 0$ and $\theta = 180°$, will give the amount of work done during one stroke of the piston, and

$$W = pr\int_0^{180°} \sin \theta d\theta = p \text{ ver. sin } 180° - 0 = p\,2r = pL \quad . \quad . \quad (3)$$

—*Albert Aston, Chief Engineer U.S.N.*

CRANK-AXLE. In "inside connected" locomotive-engines, the axle of the forward driving-wheels, upon which the cranks are forged.

CRANK-HATCH. In side-wheel steamers, a hatch around or above the cranks.

CRANK-PIN. A cylindrical piece of metal fitted to or wrought upon the end of a crank, forming a journal for the connecting-rod. Fitted pins are usually made of steel.

CRANK-SHAFT. In screw-propeller engines, a section of the shafting containing the main journals, cranks, and crank-pins. It may be forged of wrought iron or cast of steel in one solid piece, or, when the cranks have sufficient length, they and their pins may be made separately and fitted together, making what is called a "built-up" crank-shaft.

CRANK-WHEEL. A cast-iron wheel carrying a crank-pin, and used as a substitute for a crank.

Crank, or Crank-sided. That quality in a vessel which renders it incapable of carrying sail without danger of capsizing. It may be the consequence of a faulty construction, or of an injudicious stowing of the ballast and cargo.

CRANKY. Crank. Touchy; easily irritated.

Crappo, Johnny Crappo, or General Crappo. Jack's appellation for a Frenchman.

Crare, or Crayer. An unwieldy trading-vessel of olden times.

Crater (Lat. "The Cup"). *a Crateris*, Alkes.

Craven, Thomas T., Rear-Admiral U.S.N., was born in the District of Columbia. Appointed from New Hampshire, May 1, 1822; promoted to passed midshipman, May 24, 1828; commissioned as lieutenant, May 27, 1830; commissioned as commander, December 16, 1852.

Commissioned as captain, June 7, 1861; commanding sloop-of-war "Brooklyn," Home Squadron, 1861–62; while in command of the "Brooklyn," participated in the attack upon and passage of Forts Jackson and St. Philip. In this action, Capt. Craven's vessel became entangled in the hulks and rafts which sustained the chain barricade of the river, and, while in this situation, received a severe fire from Fort St. Philip, and was attacked by one of the enemy's rams and a large rebel steamer; the latter received a broadside from the "Brooklyn," at sixty yards, so well delivered as to end the conflict, so far as the steamer was concerned.

The ram struck the "Brooklyn" at the starboard gangway, but the chain-armor proved a perfect protection. By this time the "Brooklyn" had swung clear of the obstructions, and passed on up the river. Capt. Craven continued in command of the "Brooklyn," taking part in all the engagements along the Mississippi River, up to and including that of Vicksburg, until late in the summer of 1862, when he was detached and ordered North.

Commissioned as commodore, July 10, 1862; commanding steam-frigate "Niagara," special service, European waters, 1864–65.

Commissioned as rear-admiral, October 10, 1866; commandant of navy-yard, Mare Island,

California, 1867–68; commanding North Pacific Squadron, 1869. Retired Dec. 1869.

Craven, Tunis Aug. Macdonough, Commander U.S.N. Born in Portsmouth, N. H.; killed in the ironclad "Tecumseh," destroyed by a torpedo in Mobile Bay, August 5, 1864. Midshipman, February 2, 1829; lieutenant, 1841; commander, April 24, 1861. He had twenty years' sea-service, and eight years in the coast survey, and during the civil war commanded the "Crusader," the "Tuscarora," and the "Tecumseh."

Craw-fish, or Cray-fish. A lobster-like crustacean (*Astacus fluviatilis*), found in fresh water.

Crawl. A sort of pen, formed by a barrier of stakes and hurdles on the sea-coast, to contain fish or turtle. A pen for slaves awaiting shipment.

Crawling Off. Working off a lee shore by slow degrees.

Crazy. Shattered; rickety.

Creak. The noise made by a sheave when a heavy strain is brought upon it; also, the noise made by masts, ladders, and bulkheads when rolling heavily.

Crear. A kind of Scotch lighter.

Creek. A narrow inlet of the sea; it differs from a cove in being narrower, deeper, and longer. A brook or small river.

Creel, or Crue. See Kreel.

Creep. To drag an anchor or cable.

Creeper. A small grapnel used in searching for objects at the bottom of a harbor.

Creighton, Johnston B., Commodore U.S.N. Born in Rhode Island. Appointed from Rhode Island, February 10, 1838; attached to sloop-of-war "Levant," frigate "Constellation," sloop-of-war "Natchez," and frigate "Macedonian," in West Indies, 1840; frigate "Columbia," Brazil Squadron, 1843.

Promoted to passed midshipman, May 20, 1844; brig "Truxtun," coast of Africa, 1844–46; sloop "Dale," Pacific Squadron, 1846–47; storeship "Lexington," Pacific Squadron, 1848–50; steamer "Michigan," on the lakes, 1850–52; frigate "Cumberland," Mediterranean Squadron, 1852–55.

Commissioned as lieutenant, October 9, 1853; navy-yard, Boston, 1856–58; steam-frigate "Roanoke," Home Squadron, 1859–60; commanding steamer "Ottawa," South Atlantic Blockading Squadron, 1862.

Commissioned as commander, September 20, 1862; special duty, 1863; commanding steamer "Mahaska," South Atlantic Blockading Squadron, 1863–64; from August 8 to 21, 1863, bombarding Forts Wagner and Gregg, Morris Island, S. C., while in command of the "Mahaska"; commanding the steamer "Mingo," South Atlantic Blockading Squadron, 1864–65; took possession of Georgetown, S. C., and endeavored to communicate with General Sherman,—held it until relieved by army; ordnance duty, New York, 1866–67; commanding steam-sloop "Oneida," Asiatic Squadron, 1867–69.

Commissioned as captain, November 26, 1868; special duty, New York, 1870-71; commanding "Guerriere," European Squadron, 1871–72; member Board of Examiners, 1873–74.

Commissioned as commodore, November 9, 1874; commandant navy-yard, Norfolk, Va., 1876–79.

Creng. See Crang.

Crengle, or Crenkle. See Cringle.

Creole. One born within the tropics. One born in America or the West Indies of European ancestors.

Crepusculum. A circle parallel to and about 18° below the horizon; during twilight the sun is above this circle and below the horizon. Twilight.

Crespie. A term for a small whale or grampus.

Cresset. A beacon light on a watch-tower.

Crest. The summit of a wave.

Crew. The men who man a ship, boat, or gun. The word crew in law includes every person attached to a ship; when it is intended to exclude the officers the context shows it. The term is also applied to certain gangs of men on board ship; as, the carpenter's crew, gunner's crew, etc., but they are generally called *gangs*.

Crib. A small berth. A small raft. A structure of logs filled with stones, etc., and used as a dam, pier, ice-breaker, etc.

Crick. A small jack-screw.

Crimp. A term applied to a man who decoys seamen, plies them with liquor, induces them to sign articles while intoxicated, and presents extortionate claims for money advanced, board- and lodging-money, etc.

Cringle. An eye or grommet in the head, leech, or clew of a sail. It is generally worked around a metal thimble, and serves as a convenient means of attaching the bowline-bridles, earings, etc., to the sail.

Croaker. A grumbler; one who habitually forebodes evil; an alarmist. A tropical fish which makes a peculiar noise.

Croaky. A term applied to a plank when it curves much in a short length.

Crochert. An ancient hagbut or hand-cannon.

Crocodile. A reptile of the genus *Crocodilus*. It attains a length of 18 feet, and is found in Africa, Asia, and America. The American crocodile is properly an alligator. The men who served with Lord Keith in Egypt were called crocodiles.

Crocodile Tears. False tears; hypocritical sorrow. A term derived from the tales of travelers, who represented the crocodile as shedding tears over its prey.

Cronstadt. A seaport town of Russia, 20 miles W. of St. Petersburg, on the long, flat, and arid island of Kotlin, near the eastern extremity of the Gulf of Finland. Lat. 59° 59′ 42″ N.; lon. 29° 46′ 30″ E. The town is on the southeastern extremity of the island, opposite the mouth of the Neva, and is strongly fortified on all sides. It is intersected by two canals, which have their sides of granite, and are both deep and wide enough to admit the largest vessels. The one is used as a repairing-dock and the other for commercial purposes. Between the two canals stands a handsome palace, built by Prince Mentchikof, now occupied as a naval school, and attended by 300 pupils. The other public buildings deserving of notice are the marine hospital, the churches, the British seamen's hospital, the exchange, custom-house, admiralty, arsenal, barracks, cannon-foundry, etc., and the small palace in which Peter the Great resided. Pop. 48,000.

Crook. A crooked timber. A *natural crook*

is formed by the trunk of a tree and its branch, or by a large branch and a smaller one.

Crooked-catch. An iron implement bent in the form of the letter S.

Crooner. The gray gurnard (*Trigla gurnardus*), so called on account of the creaking noise it makes after being taken.

Crosby, Peirce, Commodore U.S.N. Born in Delaware Co., Pa. Appointed midshipman from Pennsylvania, June 5, 1838; attached to line-of-battle ship "Ohio," from 1838 until the summer of 1841, while flag-ship in the Mediterranean; attached to receiving-vessel "Experiment," at Philadelphia; afterward attached to steamer "Mississippi," on her trial-trip with the "Missouri," from New York to Washington. In 1842, was attached to the frigate "Congress," and sailed with her from Portsmouth, N. H., to the Mediterranean; served in her six months; was then transferred to the sloop "Preble," and returned to the United States in the fall of 1843, and was then attached to the Naval School at Philadelphia.

Promoted to passed midshipman, May, 1844; coast survey from summer of 1844 to summer of 1846, when he was ordered to the sloop "Decatur," and served in her six months in the Gulf of Mexico, during the Mexican war; participated in the attack and capture of Tuspan and Tabasco. Was then transferred to the gunboat "Petrel," and served in her one year, until peace was declared in the summer of 1848; afterward was attached to the store-ship "Relief," in 1849, carrying supplies to the Mediterranean and Coast of Africa Squadron, until the summer of 1850; attached to Philadelphia Navy-Yard from fall of 1850 to 1852, inclusive, and then transferred to receiving-ship stationed at Philadelphia, until spring of 1853; became attached to the frigate "Sacramento," then fitting for sea at Norfolk; was soon detached from her and placed on waiting orders.

Commissioned as lieutenant, September 3, 1853; in the winter of 1853, was ordered to sloop "Germantown," and sailed in her in the spring of 1854, from Boston to the coast of Brazil, and returned to the United States in February, 1857; attached to receiving-ship at Philadelphia until the latter part of 1858; sailed in the sloop "Saratoga," in the fall of 1858, for the Gulf of Mexico, and with the exception of forty days on board the "Brooklyn," under Capt. (late Admiral) Farragut, served two years, and returned to the United States in the "Saratoga," in 1860; attached to the receiving-ship at Philadelphia from 1860 to the spring of 1861; in the spring and summer of 1861, served in Chesapeake Bay, keeping open communication between Annapolis and Havre de Grace, capturing and destroying rebel vessels in the bay, and cutting off rebel supplies and communications. In the summer of 1861, received orders, and was attached to the frigate "Cumberland"; was detailed for duty on shore at Fortress Monroe; transported the troops across Hampton Creek, on the night prior to the battle of Big Bethel, also transported them on their return after their unsuccessful attempt to take that place. Volunteered and took the steamer "Fannie" (a canal-boat), secured her boilers temporarily down to the deck with chains, and proceeded with her, in company with the squadron, to the attack on Forts Hatteras and Clarke, in order to have a light-draft vessel to operate in landing troops at that place; superintended the landing of troops, until the heavy surf swamped and broke up the boats and dashed them on the beach, when Lieut. Crosby took a ship's heavy launch and landed two more boat-loads of troops, until the sea became so heavy that it threw the launch upon the beach, dashing all the crew out of her on to the shore. After thus having landed three hundred men and officers, the squadron and transports, on account of the bad weather, stood off seaward, leaving the troops landed on the shore until the following day, when the squadron returned, opened fire, and captured the forts, which were garrisoned by over seven hundred men, who had been led to believe, by the display made by the troops landed, that their force was over two thousand strong. In this way the rebels were deceived, and our troops were saved from attack and probable capture, as nearly all the ammunition was wet, and the volunteer troops, being in a disorganized state, could not, in all probability, have successfully opposed double their number. Lieut. Crosby succeeded in getting a strong picket thrown across the point in front of the enemy's batteries, thus preventing their making a reconnoissance or ascertaining the actual force of the Union troops, when the squadron returned on the following day, and relieved them from their critical position. Was especially mentioned in Gen. Butler's official report of the expedition. Captured several schooners running the blockade, they not knowing the forts had surrendered.

In the fall, and shortly after the capture of these forts, was ordered to the command of the gunboat "Pembina," fitting out at New York; but was taken dangerously ill with typhoid fever, brought on by constant exposure, privations, and fatigue in the performance of his duties. In the winter of 1861, took command of the gunboat "Pinola," at Baltimore; took her to Washington, received her battery, and sailed for the Gulf Squadron, joining Admiral Farragut's command in the spring of 1862. While on his way to join the squadron, captured the schooner "Cora," loaded with cotton, and sent her North as a prize. Commanded the "Pinola" on the memorable night when she co-operated with the "Itasca" in breaking through the chain barrier across the Mississippi, at Forts Jackson and St. Philip. The "Itasca" successfully slipped the end of the cable on the opposite shore to Fort Jackson, and in so doing ran hard and fast aground, but through the skillful exertions of Commander Crosby, was rescued from her critical position, at about two o'clock in the morning. The "Pinola's" duty on this occasion was to blow up with torpedoes the vessels holding the chain barrier, and anchored directly under Fort Jackson's guns,—which was twice tried. The vessels were boarded, which immediately drew the fire of Fort Jackson; torpedoes were placed in the hold, also outside of the vessels, and everything carefully arranged; but owing to the mass of floating timber around the vessels, the strong current and dark night, the wires attached to the galvanic battery and torpedoes were broken just as the attempt was made to explode them. When the third attémpt was about being made, a boat arrived alongside, announcing the "Itasca"

ashore, and in want of the "Pinola's" assistance to get her afloat; the attempt to blow up the vessels was reluctantly given up for the time, to assist the "Itasca," and in going to her assistance again drew the fire of Fort Jackson. In the first attempt to pull the "Itasca" afloat, two hawsers broke, but succeeded with an 11-inch hawser the second time in pulling her off; and in doing this, the "Pinola" passed well up through the barrier under Fort St. Philip, far enough to prove that the road was clear, but owing to the heavy bombardment of the mortar-fleet, was not heard or seen.

Participated in the bombardment and passage of Forts Jackson and St. Philip, Chalmette batteries, and capture of New Orleans; also in the bombardment, passage, and re-passage of batteries at Vicksburg, and engagement with the rebel ironclad "Arkansas." Blockaded off Mobile in the fall of 1862; was ordered North to command the ironclad "Sangamon."

Was promoted to commander, September 3, 1862; detached from "Sangamon," and appointed fleet-captain, North Atlantic Squadron, under Rear-Admiral S. P. Lee; commanded an expedition up the York River, co-operating with Gen. Dix, in command of the army corps at the White House. In the winter of 1863, took command of the "Florida," destroyed two blockade-runners at Masonboro' Inlet, while attempting to run the blockade, just at the break of day, and in so doing drew the sharp fire of flying batteries on shore; was transferred to the command of the "Keystone State" in 1864; captured five blockade-runners while in command of her, and caused many others to throw overboard their cargoes in order to escape. Detached from "Keystone State," and ordered to the "Muscoota"; detached from the "Muscoota," and ordered to the "Metacomet," 1864–65; blockaded off Galveston, Texas, and commanded her in the attack on Mobile. Planned and directed the construction of torpedo-nets, and spread them from shore to shore of the Blakely River, which caught all the floating torpedoes sent down to destroy the vessel; also planned torpedo drag-nets, superintended the removal of one hundred and forty torpedoes, and successfully cleared the track so as to allow the squadron to pass up safely to the city of Mobile. Occupied Forts Huger and Tracy on the night of the evacuation by the rebel forces; was especially commended by Admiral Thatcher in his official report of the naval operations at that port; was detached from the "Metacomet," on her return to Philadelphia, in August, 1865, at the close of the war. In September, 1865, received orders to command the "Shamokin"; sailed in her for the coast of Brazil, where he remained until 1868.

Promoted to captain, May 27, 1868, and detached, returning to the United States by the mail-steamer. While in command of the "Shamokin" conveyed Minister Washburn to Paraguay. At Norfolk Navy-Yard as inspector of ordnance, 1869–70; navy-yard, Philadelphia, 1871–72; navy-yard, Washington, 1872–74.

Commissioned as commodore, October 3, 1874; commanding naval station, League Island, since 1878.

Cross. See HAWSE.

Cross-bar Shot. A projectile specially adapted for cutting the enemy's rigging; when folded it presented a complete bar or shot, but when it left the gun it expanded, forming a cross with a quarter ball at the end of each arm.

Cross-beam. A beam extending across the ship from side to side.

Cross-bearings. See BEARING.

Cross-fish. A name for the star-fish, from the Norwegian *kors-fisk.* Also, the *Uraster rubens.*

Cross-head. A strong beam of iron or steel, confined to rectilinear motion by slides or by a "parallel motion," to which the outer ends of piston-rods are firmly secured. In back-acting engines with single piston-rods it is provided with eyes, to which side rods are rigidly secured, and which extend outside of the cranks to corresponding eyes on a second cross-head running in slides, and on which is the connecting-rod journal. When two cross-heads are used they are called, respectively, the "piston-rod cross-head" and "connecting-rod cross-head." In direct-acting, beam-, or side-lever engines, the piston-rod cross-head is provided with journals for the connecting-rod, links, or side rods, as the case may be.

Cross-jack (Pro. *crojek*). The sail which, in the merchant service, is bent to the *cross-jack yard*, or lower yard on the mizzen-mast. In the navy a sail is never bent to this yard. The *cross-jack braces* are the braces by which the cross-jack yard is moved about, but the term also includes all the braces on the mizzen.

Cross-sea A sea which does not set in the direction toward which the wind is blowing. During a cyclone the wind changes rapidly, and each change in the wind tends to produce a change in the set of the sea, so that in a part of the sea which has experienced all the changes of one of these gales, the sea runs up in pyramids, sending the tops of the waves up into the air.

Cross-spalls. Pieces of plank that keep the frame to the proper breadth until the beams are in.

Cross-swell. The same as a cross-sea, except that the waves undulate without breaking violently.

Cross-tail. In side-lever engines, a strong beam of iron or steel to which one end of the connecting-rod and of the links connecting with the end-centres of the beams are rigidly attached.

Cross-timbers. The pieces of timber bolted athwartships to the bitts, for taking turns with the cable or belaying ropes to. Also, a rack with belaying-pins through it extending over the windlass of a merchant ship.

Cross-trees. Timbers athwart the lower and topmast trestle-trees to support the frame of the top and give spread to the topgallant shrouds. Each athwartship timber is called a *horn.*

Cross-wires. Spider-wires placed in the focus of the object-glass of an astronomical telescope. In this position they become visible by stopping pencils of rays, which there converge to points. In this focus, also, the image of a heavenly body as it passes over the field of view is simultaneously seen, and its place is noted by referring it to the cross-wires.

Crotch. See CRUTCH.

Crotchet. A crotch. Also, an old spelling of *cross-jack.*

Crow, or Crow-bar. An iron lever with a sharp point or edge for moving heavy weights.

Crowd. *To crowd sail* is to carry an extraordinary press of canvas; as, in chasing.

Crow-foot. A combination of small lines rove through an euphroe and secured to the back-bone of an awning. To this is hooked the *crow-foot halliards*, by which the midship part of an awning is kept from sagging down.

Crown. The round up of the deck from a straight or level line. The decks of nearly all ships are higher in the centre than at the sides, in order to shed the water. An English silver coin of the value of five shillings,—about $1.20. The external arch of an anchor, upon which it falls when let go perpendicularly. The most violent part of a gale. *To crown* a knot is to finish it up by laying the ends of the strands over and under each other, so that they will bind and keep the knot from unlaying. To *double crown* a knot is to follow the parts of the single crown a second time with the ends of the strands.

Crown-rope. A line used in the cable-tiers to keep the fakes in place.

Crow-purse. The egg-capsule of a skate.

Crow-shell. A fresh-water mussel.

Crow's Nest. A perch for the look-out at the mast-head; used particularly in whalers.

Croy. An inclosure for catching fish. When the tide flows the fishes swim over the wattles, but are left by the ebbing of the water.

Crue. See Kreel.

Crue-herring. The shad (*Clupea alosa*).

Cruer. See Crare.

Cruise. To sail on the ocean; as, in search of an enemy, for the protection of others, or in quest of pleasure or plunder. A voyage made in various directions in search of an enemy, etc.

Cruiser. Any armed vessel that cruises. Formerly, a small fast vessel to harass the enemy and protect the commerce of its own country.

Cruive. An inclosed space in a dam or weir for taking salmon.

Crummy. Fleshy or corpulent.

Crupper. An old name for the train-tackle bolt in a gun-carriage.

Crupper-chain. A chain for confining the jib-boom to the bowsprit.

Crusado. See Cruzado.

Crutch. A stanchion of wood or iron, whose upper part is forked for receiving and supporting a mast, yard, boom, etc.

Crux (Lat. "The Cross"). A constellation which, with Centaurus, constitutes a bright group in the southern hemisphere, in a line with Arcturus and Spica.

Cruzado. See Money.

Cubbridge Heads. The old bulkheads of the forecastle and half-decks, wherein were placed the "murderers," or guns for clearing the decks when boarded.

Cub-house, or Cubboos. See Caboose.

Cubiculatæ. Roman ships furnished with cabins.

Cuckold's-knot, or Cuckold's-neck. A hitch by which a rope is secured to a spar,—the two parts of the rope cross each other, and are seized together.

Cudbear. See Corkir.

Cudberduce. The cuthbert-duck, a bird of the Farn Isles, off Northumberland.

Cuddie, or Cuddin. One of the many names for the coal-fish.

Cudding. A name for the char.

Cuddy. A small cabin. A sort of cabin or cook-room, generally in the fore part, but sometimes near the stern, of barges and lighters.

Cuddy-legs. A name for large herrings.

Culagium. A law-term for the laying up of a ship in the dock for repairs.

Culch. Stone, shells, etc. See Oyster-bed.

Cullock. A species of bivalved mollusk (*Tellina rhomboides*).

Culminate (Lat. *culmen*, the top, ridge). The heavenly bodies in their diurnal revolution, when they attain their greatest and their least altitude above the horizon, are said to culminate; this happens when they cross the meridian. All those bodies which are within the circle of perpetual apparition visibly come to the meridian twice in every diurnal revolution, once *above* and once *below* the elevated pole. These are respectively called their *Upper* and *Lower Culminations.* Other bodies which show themselves culminate but once.

Culring. An old corruption of *culverin.*

Culverin. An ancient cannon, so called because it was ornamented with serpents (*Coluber*, a snake).

Culver-tailed. Dove-tailed.

Culward. The archaic term for a coward.

Cumulo-cirro-stratus. The nimbus, or rain-cloud. See Cloud.

Cumulo-stratus. The twain-cloud, so called because the cumulus blends with the stratus. See Cloud.

Cumulus. The day- or summer-cloud. See Cloud.

Cund. To give notice of the direction of a shoal of fish.

Cunn. See Conn.

Cunneng. A name for the lamprey.

Cup. A solid piece of cast iron in which the spindle of a capstan works.

Cuppy. A defect sometimes found in timber, where a portion of the heart has separated from the outside; probably caused by lightning or severe frosts.

Cur. A name for the bull-head.

Cur-fish. A small kind of dog-fish.

Curl-cloud. See Cloud.

Curlew. A coast bird with a long, curved bill (*Numenius arquatus*).

Currach. A skiff formerly used on the Scottish coasts.

Curra-curra. A peculiarly fast boat in the Malay Islands.

Currents. The surface of the ocean is furrowed and its depths traversed by streams of running water, forming a system of circulation as complete, more regular, but intimately connected with, the currents of the air. These currents are due to two primary causes,—the action of the winds and the heat of the sun. As water is a non-conductor, when a portion of the surface of the sea is heated, that part only becoming subject to the evaporative effects of the sun becomes heavier and sinks, its place being supplied by colder currents from the bottom or from other localities. But these vertical currents are modified by the action of the prevailing winds and the motion of the earth on its axis. The permanent winds, blowing in a westerly direction,

where the water is hottest, at the tropics, impel the waters westward in their course. Were it not for the continents we should thus have a westerly current around the globe at the equator. But this westerly current, crossing the two oceans, strikes the continents, turns to the northward, until it is impelled in an easterly direction by the centrifugal force generated by the revolution of the earth on its axis, and flows into itself again, being divided or modified as it impinges on continents or islands in its track. The spaces thus vacated by the hotter waters of the globe are filled partly by a compensating system of cold surface currents, but principally by under-currents of cold water flowing from the frozen regions of the globe. The influence of the superficial currents is not felt at any great depth below the surface, extending only from 300 to 500 fathoms.

Besides these primary causes of the general currents of the globe, they are also caused by the tide, by storms, and by the gradual or rapid fall of streams of water from higher portions of the earth, and rivers sometimes prolong their action far into the waters fed by them.

The great currents of the ocean are of the utmost importance, modifying the climates of the globe, aiding navigation in the great commercial waters, and distributing the animals of warmer seas over colder regions; and the navigator is particularly interested in them.

Currents exist all over the ocean, very slight in some places and strong in others. We may divide them into great currents, lesser currents, tidal currents, storm currents, and river currents. The former only need claim our attention to any extent. The warm currents of the two oceans are divided into many, all, however, offshoots or parts of the same general streams. In the Atlantic, the northeast trade-wind blows the warm waters of the tropics into the heated basins of the Caribbean Sea and the Gulf of Mexico. These tepid waters, pouring from the narrow straits of Florida, form the mighty Gulf Stream. Similarly, in the Pacific, the waters of the equatorial region form the Kuro Siwo, or Japan stream. These mighty rivers of heated water resemble each other in their prominent features. The Gulf Stream is from forty to several hundreds of miles wide, is a deep indigo blue in color, is from ten to twenty degrees hotter than the surrounding waters of the ocean, is swifter at its commencement and in the centre, is traversed by various currents of cold water, throws off streams of hot water from its banks, that recurve in an opposite direction to it. Its velocity is from one to five miles an hour, and is less in its northerly portions by reason of friction and the slower rotation of those portions of the earth. Its banks are well defined, ripples being often seen, and sudden changes of temperature announcing it. They vary with the season, following the sun in its course, and with the prevailing winds. Its temperature varies from 62° in winter to 82° in summer. Its waters teem with animal life, and its banks are enshrouded in clouds, fogs, and storms. On reaching the eastern basin of the Atlantic it divides into two branches, one flowing south, past the shores of Spain and North Africa, until, in the region of Cape Verde, it again divides, part flowing west to become again a portion of the main stream, and a branch going to the southward along the African coast, under the name of the Guinea current. The other branch of the main stream flows to the northeastward, tempering the winters of Norway.

The southeast trade-wind also forms its current, which is called the Equatorial current. Flowing to the northwestward, across the ocean, it divides on reaching the continent of South America, one branch flowing into the Caribbean Sea and feeding the Gulf Stream, and the other, turning to the southwestward, called the Brazil current, loses itself in the cold currents of the Southern Ocean. These warm currents are partly balanced by the cold currents, the Arctic and the Cape Horn currents, both bearing icebergs from the frozen regions. The Arctic current, flowing from the eastward of Greenland, is joined by the Hudson Bay current, and united they form the Labrador current, flowing down inside the Gulf Stream along the American coast until it dips under the Gulf Stream and is lost in the equatorial waters. The Cape Horn current is a branch of the Antarctic drift.

The current circulation of the Pacific resembles that of the Atlantic. A north equatorial drift-current is here impelled to the westward by the northeast trade-winds, a Gulf Stream formed in the Kuro Siwo, furrowed by hot and cold streams, as the Gulf Stream, like it hotter by several degrees than the surrounding ocean, and diminishing in velocity to the eastward. Its color is dark blue, and it is joined during certain seasons by the monsoon drift-currents of the China Sea. About the latitude of 40° N., it divides into two branches, one flowing to the northward, warming the bleak Kamschatkan coast, and passing through Behring Straits, losing itself in the Arctic Ocean. The other flows to the eastward, then south down the American coast, and again is caught by the trade-wind, and blown across the ocean, a part of it, however, still flowing down the Mexican coast as far as the equator. The southeast trade also here causes its equatorial current, and this, flowing across the Pacific, throws off two branches about 178° W., one curving to the northward and eastward, and losing itself in the counter-current, the other turning to the southward and eastward until it meets with a cold current, and the main stream loses itself among the islands. A cold current flows from the Arctic regions, through Behring's Straits, and down the Asiatic coast. The Southern Pacific has also a cold current, Humboldt's, or the Penwan, flowing to the northward along the South American coast, part of it entering into the trade drift, and a part of it flowing as far north as the equator.

The currents of the Indian Ocean are so affected by the prevailing monsoon as not to be constant in direction during the whole year. There is, however, one warm current—the Agulhas current—which flows from the equator in a southwesterly direction, between the coast of Africa and Madagascar. It throws off a branch to the eastward, soon lost in the cold current, and its main body passes around the Cape of Good Hope into the Atlantic, joining the southeast trade drifts there.

The warm currents thus impelled from equatorial regions are fed by streams of cold water, welling up from Antarctic regions. The great

Antarctic drift-current, coming from the frozen regions near the south pole, are deflected to the eastward by the westerly winds that here blow around the globe. The offshoots of this great current, known as Humboldt's, and the Cape Horn current, have been alluded to. Besides these, the great southern connecting current flows on past the southern point of Africa and through the Indian Ocean, until it arrives on the west coast of Australia. It there divides into two branches, one flowing to the northward, a part of it working through Macassar Straits, and forming a great counter-current across the Pacific Ocean, and a part curving to the westward across the Indian Ocean, joining the warm Agulhas current at Mozambique. The southern branch is the Southern Australian current, which, after passing south of that great continent, throws off an offshoot—the East Australian current—to the northeastward, and, continuing east with its parent stream,—the Antarctic drift,—it curves westward again, recrossing the Pacific about the tropic of Capricorn, and is lost in tropical waters.

In the calm spaces formed by these currents, in bays and inlets near the coast, in interior lakes, etc., there are often currents, depending on wind or tide, or other cause. The storms, whether circular or translatory, carry with them a storm wave and appreciable current. The tidal wave, in its passage about the earth, carries a powerful current with it. The great rivers of the earth, as they emerge from their banks, carry their discolored streams far into the waters. The Amazon, La Plata, and other great rivers make their currents felt hundreds of miles from the coast. The investigation of currents has been greatly forwarded by the labors of Maury, by the Coast Survey, and deep-sea sounding vessels, and by the recent "Challenger" voyage of exploration of sea depths. Much remains yet to be known, and the great current charts need to be revised, added to, and corrected constantly.

The exact determination and measurement of a current are important problems in scientific navigation. It is somewhat difficult to determine the velocity and direction of a current in mid-ocean, from having no fixed point as a basis. The usual method employed by navigators, sufficiently exact for their purpose, is to compare the positions of the ship from time to time, as from one noon to the other, obtained by measurement of her speed, with those found by astronomical means, or, as sailors say, position by dead-reckoning with position by observation. If the measuring instrument were not affected by the current this would give the exact force of the current during the interval, but the logship is affected by the current, and hence this does not give the exact current. The following example illustrates this method of finding the current:

Lat., dead reckoning...	51° N.	Lon., dead reckoning..	76° W.
Lat., by obs. of sun.....	49° N.	Lon., observation	75° W.
Difference............	2° N.	Difference............	1° W.

But this sixty minutes of longitude represents, in lat. 50°, 38.6′. With this *departure*, and the difference of latitude, we find the difference due to currents, from tables, to be 126′, and its course to be S. 18° E. This is the *set* of the current, and the distance 126′ is its *drift*. The set is always in the direction of the true position from the estimated. Hence the set and drift of the current are the course and distance corresponding to the difference of latitude and departure between the two positions. To find the effect of a current upon a course and rate of speed, a reverse operation is performed. When a course is to be laid down for a port, the current, if known, must be allowed for. This is usually done graphically on a chart. But it may be done by calculation. The correction is found by its sine, which is equal to the rate of the current x by the difference between its set and the course, divided by the distance to be sailed, or $\sin x = \frac{r \sin (c - s)}{d}$. Then the correct course would be $C = c - x$. In beating to windward, the current is also to be considered, that tack on which it helps being the best, or "long tack." The currents of the depths of the ocean are less easily obtained. The temperatures obtained in sounding are sometimes a guide to the currents, and they may be measured by a fan attached to a buoy, when a fixed point from which to observe the course of the buoy can be obtained; but this is rarely the case, and such currents will long remain but partially known.—*F. S. Bassett, Lieutenant U.S.N.*

Currier. A small musketoon mounted on a swivel.

Cursa. The star β *Eridani.*

Curtall, or **Curtald.** An ancient piece of naval ordnance.

Curtle-ax. An old name for a cutlass.

Cuseforne. A long, open whale-boat of Japan.

Cushing, W. B., Commander U.S.N. William B. Cushing was born in Delafield, Wis., November 4, 1842; entered the Naval Academy at Annapolis, Md., September 25, 1857; resigned March 23, 1861, and as soon as possible thereafter entered the naval service afloat as an acting master's mate. His disposition and temperament would not permit him to remain at a naval school in time of war; he would not have been able to give a single thought to theoretical study.

In the following October he was restored to his rank as midshipman. March 27 he was detached from the "Cambridge" sick, and granted one month's leave. The following May he was ordered to the "Minnesota," and was promoted to the rank of lieutenant from the 16th of July, with a large number of young officers, made necessary to supply the demands of the service growing out of the civil war.

Henceforth, for a period of nearly three years, his career was singularly conspicuous in deeds of daring, in a service where a lack of gallantry would have brought disgrace.

When in command of a small steamer engaged in blockading, he sought opportunities of visiting the inland waters of the enemy in his boats, usually after night, and would sometimes lie concealed during the following day, always having in view some definite object, whether commensurate with the risks involved or otherwise. At other times in narrow waters, in the vessel he commanded, he would find himself fiercely engaged with the field-batteries of the enemy.

When blockading the coast near New Topsail Inlet he discovered a schooner within, and made a reconnoissance in his boats, but soon found himself under fire of the enemy's field-pieces and small-arms, in the hands of a considerable force guarding the inlet. He retired, but determined

to destroy the schooner lying some miles from the guarded point of entrance.

Persons familiar with inlets in marshy countries know that usually they are very tortuous, and often lead for miles along or near sand-spits which separate the channels from the ocean. Such was the configuration of New Topsail Inlet. Late in the evening, August 22, 1863, Lieut. Cushing anchored the "Shokokon" close to the beach abreast the schooner, and several miles distant from the entrance to the inlet. He sent two boats with crews on shore, the larger one to act as a support. The men hauled the smaller boat across the sand beach and launched it in the stream. Acting Ensign James C. Coney was sent in this boat with a force of six men to destroy the schooner. They pulled along until within a short distance from the vessel of the enemy, where they landed and sent a man to reconnoitre, who brought the information that some twenty men with a small piece of artillery were guarding the vessel. A charge was made, the enemy routed, ten prisoners, one howitzer, and eighteen small-arms captured; the schooner and adjacent salt-works were destroyed, and the expedition rejoined the vessel without loss.

In the winter of 1864, when blockading the Cape Fear River, Cushing determined to pay a visit to Smithville in a boat having a crew of but six men. In entering the river he had to pass Fort Caswell, mounting heavy guns, and at Smithville, his destined point, two miles above, he knew there was a battery of five guns and a considerable garrison. He landed one hundred yards above the battery, came into the village, and across the street into Gen. Hebert's house, a large building with a piazza; the hour was about 11 P.M. Major Hardeman and Capt. Kelly, of the general's staff, were down-stairs and about retiring, when the former hearing footsteps on the piazza and supposing his servant was there, threw up a window, when a navy pistol was thrust in his face and a demand made to surrender. He instantly pushed the pistol aside, and escaped through a back-door, calling upon Kelly, his companion, to follow, as the enemy were upon them. The latter failed to comprehend, and was taken prisoner and carried off by Cushing, who embarked at once, knowing that an alarm would immediately be given. In speaking of this occurrence, Cushing said that it was a beautiful, bright moonlight night, and that he counted upon a lack of vigilance of the enemy from that fact. The soldiers were quartered in the immediate vicinity where his prisoner was captured.

An army officer who was at the capture of Newbern mentioned that Cushing in command of navy howitzers passed along with his sailors, aided by soldiers, dragging the pieces. In landing in the marsh Cushing had lost his shoes and in the bushes his hat. Pressing on bareheaded and barefooted, he encountered the servant of Capt. Johnson, of the army, who had a pair of spare boots slung over his shoulder. Cushing asked the servant the name of the owner of the boots, and said, "Tell the captain that Lieut. Cushing, of the navy, was barefooted and has borrowed them for the day," and in spite of the remonstrances of the servant put the boots on in haste and pursued his way.

In the destruction of the plated ram "Albemarle" we see Cushing in a true heroic light. The press correspondents had for a month or more apprised the public and the enemy that Cushing was on his way from the North with a torpedo-boat to blow up the "Albemarle." No method could have been taken that would seem more efficacious to render her destruction impossible. The enemy was apprised of the arrival of the torpedo-boat in the adjacent waters; the "Albemarle" was secured to a wharf at Plymouth; a cordon of logs was placed around her at a distance of about thirty feet; a company of soldiers with small-arms and howitzers were on the wharf to defend her, and her crew on board to make use of her guns. The enemy was vigilant and Cushing's approach was discovered. Yet he pushed forward amidst a shower of bullets and the fire from the howitzers stationed on the wharf, forced his way in over the cordon of logs, lowered his torpedo and blew the vessel up at the very instant when a shell from one of the heavy guns of the "Albemarle" struck the torpedo-boat and she went down swamped by the column of water and spray, which rose high in the air when the torpedo exploded.

For this act of heroism Cushing was advanced to the grade of lieutenant-commander.

His entire career was filled with daring, cleverly planned and admirably executed; hence his unvarying success in what he undertook.

Cushing's life in war was active and heroic in the extreme; in peace he seemed to suffer as it were from inanity, or, more properly speaking, from the apparent lack or absence of a strong purpose.

After the close of the war he was for some two years the executive-officer of the "Lancaster," a position which required close attention and study to fulfill its duties in the best manner.

Afterwards he served three years in command of the "Maumee," on the Asiatic station. He was promoted in regular order of vacancies to commander January 31, 1872, and soon after was ordered to the command of the "Wyoming," on the home station, and was relieved at the end of a year, the vessel being put out of commission.

In the spring of 1874 he was ordered to the Washington Navy-Yard, and the following August he was detached at his request. He then seemed in impaired health, and expressed a desire to go South; after the lapse of a few days he showed symptoms of insanity and was removed to the government hospital, where he died December 17, 1874, at the age of 32 years and 13 days.—*Daniel Ammen*, *Rear-Admiral U.S.N.*

Cushion. A term applied when the exhaust-valve of a steam-engine closes before the piston has reached the end of its stroke, thus compressing the remaining steam. It causes the engine to run smoothly, and its resistance to the piston is compensated by the compressed steam filling the clearance and port, which would otherwise have to be filled with fresh steam from the boilers.

Cusk. A fine table-fish taken in cod-schools.

Cusp. A projecting point or horn.

Custom. Long-established practice or usage, having the force of law by reason of the general consent which it implies. The *customs of the*

service constitute the unwritten part of the law military.

Customs. Duties or imposts laid on the importation or exportation of certain commodities. Such duties were levied in ancient times, and have continued to form an important part of the revenue of most modern states. (See TARIFF.)

CUSTOMS, COLLECTION OF. The collection of custom duties in the United States is part of the business of the Treasury Department, and is confided to a bureau of that department, presided over by a Commissioner of Customs. To this bureau pertain the examination of all questions arising under the tariff laws upon appeals from decisions of Collectors of customs involving the rates and amount of duties on imports; the consideration of cases involving errors in invoices and entries, refund and abatement of duties, drawback of customs, duties on articles manufactured in the United States out of imported material, and establishing the rates of drawback; also the consideration of all questions arising upon the construction of the customs laws, and the general regulations thereunder in regard to the entry, appraisal, and delivery of merchandise, and payment of duties thereon. It also conducts correspondence with consular officers, through the Department of State, in regard to dutiable values, invoices, etc. It exercises supervision over Appraisers in securing uniformity of valuation of dutiable merchandise at the various ports, and in respect of compromises in customs cases. It has also supervision of the seal-fisheries in Alaska, and such other matters in that Territory as are placed by law in charge of the Secretary of the Treasury. There are 131 collection districts and ports, to the more important of which, viz., Boston, New York, Philadelphia, Baltimore, New Orleans, and San Francisco, a Collector, a Naval Officer, and a Surveyor are appointed. Of the lesser districts and ports some have a Collector only; some a Surveyor only. At each of the ports having the three officers it is the duty of the Collector to receive all reports, manifests, and documents to be made or exhibited on the entry of any ship or vessel, according to law and regulations; to record in books, to be kept for that purpose, all manifests; to receive the entries of all ships or vessels, and of the goods, wares, and merchandise imported in them; to estimate, together with the Naval Officer, the amount of the dues payable thereupon, indorsing such amount upon the respective entries; to receive all moneys paid for duties, and take all bonds for securing the payment thereof; to grant all permits for the unlading and delivery of goods; to employ, with the approval of the Secretary of the Treasury, proper persons as weighers, gaugers, measurers, and inspectors at the several ports within his district; to provide, with the like approval, at the public expense, store-houses for the safe-keeping of goods, and such scales, weights, and measures as may be necessary. At ports to which a Collector and Surveyor only are appointed, the Collector alone executes all the duties in which the co-operation of the Naval Officer is requisite at the ports where a Naval Officer is appointed. And he acts in like manner in case of the disability or death of the Naval Officer until a successor is appointed, unless there is a deputy duly authorized, under the hand and seal of the Naval Officer, who in that case continues to act until an appointment is made. At ports to which a Collector only is appointed, the Collector alone executes all the duties in which the co-operation of the Naval Officer is requisite at ports where a Naval Officer is appointed; and he also, as far as may be, performs all the duties prescribed for Surveyors at ports where Surveyors are authorized.

At ports to which there are appointed a Collector, a Naval Officer, and a Surveyor, it is the duty of the Naval Officer to receive copies of all manifests and entries; to estimate, together with the Collector, the duties on all merchandise subject to duty, and no duties shall be received without such estimates; to keep a separate record of such estimates; to countersign all permits, clearances, certificates, debentures, and other documents to be granted by the Collector; to examine the Collector's abstracts of duties and other accounts of receipts, bonds, and expenditures, and certify the same if found correct.

At ports to which there are appointed a Collector, Naval Officer, and Surveyor, it is the duty of the Surveyor, who is in all cases subject to the direction of the Collector, to superintend and direct all inspectors, weighers, measurers, and gaugers within his port; to report once in every week the name or names of all inspectors, weighers, gaugers, or measurers who are absent from or neglect to do their duty; to visit or inspect the vessels which arrive in his port, and make a return in writing every morning to the Collector of all vessels which have arrived from foreign ports during the preceding day, specifying the names and denominations of the vessels, the masters' names, from whence arrived, whether laden or in ballast, to what nation belonging, and, if American vessels, whether the masters thereof have or have not complied with the law, in having the required number of manifests of the cargo on board, agreeing in substance with the provisions of the law; to put on board each of such vessels one or more inspectors immediately after their arrival in his port; to ascertain the proof, quantities, and kind of distilled spirits imported, rating such spirits according to their respective degrees of proof, as defined by the laws imposing duties on spirits; to examine whether the goods imported in any vessel, and the deliveries thereof agreeably to the inspectors' returns, correspond with the permits for the landing of the same; and if any error or disagreement appears, to report the same to the Collector, and to the Naval Officer, if any; to superintend the lading for exportation of all goods entered for the benefit of any drawback, bounty, or allowance, and examine and report whether the kind, quantity, and quality of the goods so laden on board any vessel for exportation correspond with the entries and permits granted therefor; to examine, and from time to time, and particularly on the first Mondays of January and July in each year, try the weights, measures, and other instruments used in ascertaining the duties on imports, with standards to be provided by each Collector at the public expense for that purpose; and where disagreements or errors are discovered, to report the same to the Collector; and to obey and execute such directions as he may receive for correcting the same, agreeably to the standards.

At ports to which Collectors and Surveyors only are appointed, the Surveyor performs all the duties enjoined upon Surveyors by the preceding clauses, and also receives and records the copies of all manifests transmitted to him by the Collector; records all permits granted by the Collector, distinguishing the gauge, weight, measures, and quality of goods specified therein; and takes care that no goods be unladen or delivered from any ship or vessel without a proper permit for that purpose.

Surveyors, at certain ports to which no Collector or Naval Officer is appointed, perform all the duties which would be required of a Collector.

Every Collector, Naval Officer, and Surveyor is authorized, with the approval of the Secretary of the Treasury, in case of his sickness or unavoidable absence, to exercise and perform his functions, powers, and duties by deputy duly constituted under his hand and seal.

Cut. To separate or divide. Shape; style; fashion; as, the cut of a sail. A passage, channel, or canal. *A short cut*, a cross route, which shortens the distance to be sailed. *To cut*, to adjust or turn around a spar, cask, etc.; also, to strike with the edge of a sword. *To cut stick*, to make off clandestinely. *To cut and run*, to make off suddenly and rapidly; from the necessity of cutting the cable when getting under way in an emergency. *To cut off*, to intercept a vessel or vessels. *To cut out*, to seize and remove from under the guns of an enemy; as, a ship from a convoy, or a vessel from a harbor. (See CUTTING OUT.) *To cut down*, to take a deck off a vessel, thus converting a line-of-battle ship into a frigate, a frigate into a sloop, etc.; also, to cut the laniard of a hammock and let the occupant down to the deck. A ship *cuts a feather* when her bow is so sharp as to make the spray feather in cleaving the water.

CUT-OFF. A term applied when the admission of steam to a cylinder is stopped before the piston has completed its stroke, the remaining portion of the stroke being accomplished by the expansive force of the steam. The term is also applied to the various mechanical devices for effecting such stoppage, such as the Stephenson link combined with the "lap" of a plain slide-valve, "tripping" a counter-weighted valve or poppet-valve by means of cams, springs, and catches, and by independent cut-off valves. See EXPANSION OF STEAM.

CUT-OFF VALVE. A valve used for effecting a cut-off, which, with its mechanism, is independent of the main valves and their gear.

CUT OF THE JIB. The general appearance of a ship or person.

CUTTING-DOWN LINE. A curve bounding the inside of the timbers of the ship at the centre-line.

CUTTING OUT. The exploit of capturing and removing or destroying a vessel protected by the guns of a fort or fleet.

When a vessel is to be cut out from a convoy, a favorable opportunity is waited for, the vessel is boarded, and the crew confined; if able to do this without creating a noise or otherwise attracting the attention of the armed vessels, it is possible to remove the ship from the convoy and take her into port as a prize. When impossible to remove the vessel, her crew is sent into her boats, and she is fired.

When it has been determined to cut out a vessel at anchor, from under the guns of a fort or fleet, the boats are provided with essentials only, and extra men are carried if considered necessary. The crews are specially instructed in their various duties, some of them being provided with combustible material for setting the vessel on fire. The men are armed with cutlasses and revolvers, and some means of identification in the dark is decided upon.

Taking advantage of wind, weather, darkness, and the state of the tide, the oars are muffled, and the boats are rowed noiselessly towards their destination. If discovered, the boats make a dash for the vessel, the men are thrown on board, the enemy's crew is overpowered or driven below, and the vessel is fired in several places. If not discovered, the boats are rowed alongside quietly, and the vessel is boarded in silence, the hatches are guarded to keep the enemy's crew below, and the ship is fired, the boarding-party remaining by her until assured that the fire cannot be extinguished.

Cute. Sharp; crafty; cunning.

Cuth. A name for the coal-fish before it is fully grown.

Cutlass. The short, heavy sword supplied to the navy; called *cutlash* by Jack.

Cut-line. The space between the bilges of casks stowed chine and chine.

Cutt. An old horse-ferry boat.

Cutter, George F., Paymaster-General U.S.N. Entered the navy as captain's clerk to Commander John Percival, April 18, 1838, on board the sloop-of-war "Cyane," Mediterranean Squadron; discharged May 18, 1841.

Commissioned as purser, June 5, 1844; ordered to brig "Truxtun," African Squadron, June 18, 1844; detached December, 1845. Ordered to brig "Perry," West India Squadron, April 24, 1846; detached May 15, 1846, and ordered same day to brig "Truxtun," West India Squadron (Mexican war). Wrecked and taken prisoner, August, 1846; released on parole, September, 1846, and exchanged November, 1846. Ordered to receiving-ship "Franklin," navy-yard, Boston, December 4, 1846, and detached May 1, 1847. Ordered to sloop-of-war "Albany," West India Squadron, August 12, 1847 (Mexican war); detached September 11, 1850. Ordered to receiving-ship "Ohio," navy-yard, Boston, April 1, 1851; detached April 1, 1854. Ordered, April 25, 1854, to steamer "Massachusetts," Pacific Squadron; detached August, 1857. During the cruise was eighteen months in Puget Sound, Washington Territory, during the Indian war there. Ordered, October 7, 1857, to navy-yard, Portsmouth, N. H., and detached September 1, 1860, and ordered to the steamer "Richmond," flag-ship Mediterranean Squadron, September 10, 1860. When the Rebellion broke out the "Richmond" was ordered to the Mexican Gulf Squadron, and in her was present at the passage of the forts below New Orleans, capture of that city, the attack on Vicksburg, running the batteries, and the general operations on the Mississippi River, attack on the forts at entrance of Pensacola Harbor, and on blockade duty; detached from the "Richmond," October 20, 1862. Ordered North, and was ordered as fleet paymaster North Atlantic Squadron, but before taking charge of duty was detached, and

ordered, April 2, 1863, as fleet paymaster Eastern Gulf Squadron, flag-ship "San Jacinto"; detached December 1, 1863. Ordered North, and March 7, 1864, ordered as inspector in charge of stores, navy-yard, Boston; detached April 1, 1867. Ordered as purchasing paymaster, New York, June 24, 1867; detached September 2, 1867. Ordered, October 1, 1867, to flag-ship "Piscataqua," as fleet paymaster of Asiatic Squadron; detached July 23, 1869, and ordered home. January 1, 1870, ordered as inspector in charge of stores, navy-yard, Boston. Received commission as pay director March 3, 1871. Detached, as inspector, October 1, 1872, and ordered as paymaster of New York Navy-Yard; detached February 12, 1873, and ordered as purchasing and disbursing paymaster, New York; detached March 5, 1877, and appointed general inspector, Bureau of Provisions and Clothing; detached November 17, 1877, and appointed paymaster-general U. S. navy, Washington, D. C., where now on duty.

Cutter. A single-masted, sharp-built vessel, furnished generally with a running-in bowsprit, and carrying a fore-and-aft mainsail, gaff-topsail, stay-foresail, and jib. There is no jib-stay, the jib hoisting and hanging by the halliards alone. The name is derived from its fast sailing. The name cutter is also given to the small steamers in our revenue marine service. Pulling boats called cutters are the medium-sized boats supplied to the navy. They are square-sterned, double-banked, and pull 10 to 12 oars. See SAILS, BOAT'S.

CUTTER-BRIG. A square-rigged vessel with a jigger and a fore-and-aft mainsail.

CUTTER-STAY FASHION. A method of turning in dead-eyes, so called because originally used for the forestays of cutters. The end part of the shroud or stay is taken around the standing part and stopped back to its own part. This plan allows a sail to be hauled close down. The method is sometimes used for lower rigging; it presents a neat appearance, but is not so strong as the ordinary mode.

Cuttie. A name for the black guillemot (*Uria grille*).

Cuttle-fish. A common marine animal of the genus *Sepia* and class *Cephalopoda*. When in danger it ejects a black inky substance, which discolors the water for some distance; hence sometimes called the *ink-fish*.

CUTTLE-BONE. The oval, internal, calcareous shell of the cuttle-fish.

Cutty. A short-stemmed pipe. A loose woman.

Cut-water. That part of a vessel forward of the stem; it divides the column of water through which the vessel passes.

Cycle. A periodical space of time marked by the recurrence of something peculiar. *The cycle of the sun*, or *solar cycle*, is a period of 28 years, after which the same days of the week recur on the same days of the year. *The cycle of the moon*, or *Metonic cycle*, is a period of 19 solar years, after which the new and full moon fall on the same day of the year that they did 19 years before. *The cycle of indiction*, or *Roman indiction*, a period of 15 years, employed in Roman and ecclesiastical chronology. *Calippus cycle*, a period of 76 years, proposed by Calippus as an improvement on the Metonic cycle. *Cycle of eclipses*, a period of about 6586 days, the time of revolution of the moon's node,—called Saros by the Chaldæans.

Cycloid. A curve generated by a point in the plane of a circle rolled along a straight line. When the generating point is on the circumference of the circle the curve is a *common cycloid*; when it is within the circumference the curve is a *prolate*, or *inflected cycloid*; when without, the curve is called a *curtate cycloid*.

Cyclone. A revolving storm (which see).

Cygnus (Lat. "The Swan"). A constellation between Lyra and Pegasus. *α Cygni*, Arided, Deneb Adige. *β Cygni*, Albireo.

Cylinder. A right prism whose bases are circles. That portion of a gun between the base and reinforce. That part of a steam-engine in which the steam acts upon the piston. As its name implies, it is cylindrical in form. The ends are closed, and the piston, though closely fitted, and so kept by packing, is free to move, in direction of its axis, from end to end, the piston-rod passing though a stuffing-box on the cylinder-head. The material is of cast iron, and in the same casting are contained the "ports" for the admission and ejection of the steam, the necessary brackets for securing it to the frame, and flanges for securing the cylinder-covers and valve-chests. Steam-jacketed cylinders have a double shell, live steam being admitted to the annular space. In modern practice, the inner shell, in which the piston runs, is made separately, of very hard material, and secured by bolting and packing. Slide-valve seats are made of steel and bolted on. The cylinder casting also contains various brackets and projections for securing some lighter parts of the machinery.

CYLINDER COVER. The end of a cylinder which is bolted on and easily removable. It is usually made with a double shell, the two shells being supported by ribs, and the space between the shells is filled either with live steam or some non-heat-conducting material.

CYLINDER ESCAPE-VALVE. A valve, governed by a weight or spring, for relieving the cylinder of such water as may result from condensation or from priming of the boilers.

CYLINDER HEAD, or BOTTOM. The end of a cylinder which forms part of the cylinder casting; it has a double shell containing non-radiating material. In screw-propeller engines the piston-rod stuffing boxes are attached to the head.

Cymba. A Phœnician row-boat.

D.

D. An abbreviation on the paymaster's books for *discharged.* In the log-book *d* denotes *drizzling rain.*

Dab. The sea-flounder. An old term for a flat-fish of any kind, but usually appropriated to the *Platessa limanda.* The word is familiarly applied to one who is expert in anything.

Dabberlack. A kind of long sea-weed.

Dab-chick. The little grebe, *Podiceps minor.* A small diving-bird common in lakes and rivers.

Dace. A small river fish of the carp variety.

Dacoits. Robbers in India; also, the pirates who infested the rivers between Calcutta and Burhampore.

Dactylopterus. A genus of fishes containing two species, of which the most remarkable is the *flying-gurnard.*

Daggar. An old term for a dog-fish.

Dagger. A term given to any timber lying diagonally.

DAGGER-KNEE. Any hanging-knee which is inclined forward or aft.

Dagges. An old term for pistols or handguns.

Dahlgren, John A., Rear-Admiral U.S.N., was born in Philadelphia, Pa. Appointed midshipman from Pennsylvania February 1, 1826, and made his first cruise in the frigate "Macedonian," Brazil Squadron, in 1827–29; attached to sloop "Ontario," Mediterranean Squadron, in 1830–32.

Promoted to passed midshipman, April 20, 1832; served on the coast survey 1836–42.

Commissioned as lieutenant, March 8, 1837; cruised in frigate "Cumberland," Mediterranean Squadron, 1844–45; on ordnance duty from 1847–57, during which time he perfected the invention of the famous Dahlgren heavy guns, introduced howitzers for use afloat and ashore, and wrote several works relating to ordnance.

Commissioned as commander, September 14, 1855; commanded ordnance practice-ship "Plymouth," 1858–59; on ordnance duty at navy-yard, Washington, 1860–61.

On the 22d of April, 1861, a few days after the attack of the Baltimore mob on the Massachusetts regiment, all the officers of the Washington Navy-Yard resigned and left, except Commander Dahlgren, Lieut. Wainwright (who was absent sick), and the boatswain. The officers who left were the commodore commandant, a commander, two lieutenants, the surgeon, and paymaster; their resignations not being accepted, they were dismissed. The command, therefore, devolved on Commander Dahlgren, and vigorous measures were taken to defend the yard. After the alarm had subsided and the danger passed away, it was suggested that an old law (27th March, 1804) required a captain to command the yard. He was only a commander, and applications were made for his place; but the President refused to listen to them, and on August 2, 1861, Congress passed an act enabling him to retain the command.

Commissioned as captain, July 16, 1862, and shortly afterward appointed chief of Bureau of Ordnance.

Promoted to rear-admiral, February 7, 1863, and in the summer following ordered to the command of the South Atlantic Blockading Squadron, relieving Rear-Admiral Du Pont, July 6, 1863. A combined operation of naval and army forces, the latter under Gen. Gillmore, was instituted for the occupation and possession of Morris Island, on the south side of the entrance into Charleston harbor. After a long and severe struggle, the army operating upon land, with the efficient co-operation of the monitors, the new "Ironsides," and other vessels of the squadron, Morris Island with all its batteries was captured, and Fort Sumter was soon made a pile of ruins by the fierce artillery fire of the combined forces.

The fleet of Admiral Dahlgren remained inside the bar, and after the capture of Morris Island, blockade-running, as far as Charleston was concerned, was at an end.

In February, 1864, a successful expedition, commanded by Admiral Dahlgren in person, ascended the St. John's River to aid a military force intended to be thrown into Florida.

Early in July, 1864, a concerted move was made up the Stono River by Gen. Foster and Admiral Dahlgren. The military force was, however, too small. On this occasion Fort Johnson, the principal work defending Charleston on the south side of the harbor, was surprised by an adroit attack detached from the right, and the leading companies of a column headed by Col. Hoyt actually got into the work, but not being supported were made prisoners. Gen. Foster in promulgating by General Order the finding of a court of inquiry, stated that "the expedition was well planned, and would have succeeded had it not been for the absence of the commanding officer and the want of spirit and energy on the part of many of his subordinates."

On the 12th of December, 1864, Gen. Sherman having successfully accomplished his march to the sea, reached the vicinity of Savannah, and communication between him and Admiral Dahlgren was immediately established. The latter made the best possible disposition of the vessels then under his command to assist the army in attaining possession of Savannah, which was occupied by Gen. Sherman on the 21st of December.

On the 18th of February, 1865, the city of Charleston was evacuated, and Admiral Dahlgren at once moved his vessels up to the city.

The evacuation of Charleston was followed by

that of Georgetown, and on the 26th of February, the place itself was occupied by the admiral. On the 1st of March, immediately after the surrender, his flag-ship was blown up and sunk by a torpedo.

In 1866, Rear-Admiral Dahlgren was ordered to the command of the South Pacific Squadron; and returning from that service in 1868, was for the second time appointed chief of Bureau of Ordnance. In the fall of 1869 was relieved from the bureau at his own request, and ordered to the command of the Washington Navy-Yard, where he died in 1870.

DAHLGREN GUN. See ORDNANCE.

Dahm. An Arab or Indian decked boat.

Dairs. Small unsalable fish.

Dak-boat. See DAWK-BOAT.

Dale, Richard, Commodore U.S.N., was born November 6, 1756, near Norfolk, Va. He went to sea at twelve years of age, and rose to first mate in 1775. Served as lieutenant in a Virginia cruiser in 1776, and was captured by the British and confined in a prison-ship in Norfolk harbor; was there induced to join the enemy, but returned to his allegiance on being captured by Capt. Barry. Appointed midshipman in the navy, July, 1776; served in the "Lexington," and when that vessel was captured was instrumental in her recapture. Appointed master's mate, and sailed again in the "Lexington," in 1777, and cruised in Commodore Wicke's squadron in Irish waters. Captured by the "Alert," on the 19th September, he was thrown into Mill Prison, Plymouth, England. After an ineffectual attempt, he escaped to France in February, 1779, and there joined Jones, and was named first lieutenant of the "Bon Homme Richard"; sailed in that vessel July, 1779, and in her participated in the action with the "Serapis." He was the first to board that ship, and was severely wounded, September 19, 1779; served with Jones in the "Alliance," and returned home in the "Ariel" in October, 1780, receiving his commission as lieutenant. Sailed in the "Trumbull," and captured in her by the "Iris" and "General Monk," August 8, 1781. Sailed in merchant vessels, commanding some of the finest Indiamen until the reorganization of the navy in 1794; was then named fourth captain on the list, furloughed, and in the merchant service until 1798. He commanded the "Ganges," 20, the first ship under the new organization. Furloughed again until 1800. May, 1801, sailed in command of the European Squadron, in the "President," 44; blockaded Tripoli, and returned home July, 1802. Was again ordered to the Mediterranean, but, becoming dissatisfied, resigned. He died at Philadelphia, February 26, 1826, aged 69.—*F. S. Bassett, Lieutenant U.S.N.*

Dale. A trough or spout to carry off water; usually named from the office it has to perform; as, a pump-dale, etc.

Dallop. A heap or lump in a clammy state. A large quantity of anything.

Dam. A barrier of stones, stakes, or rubble constructed to stop or impede the course of a stream.

Damascened. The mixing of various metals in the Damascus blades, the kris, or other weapons; sometimes by adding silver to produce a watered effect.

Damascus Blade. Swords famed for the quality and temper of the metal as well as the beauty of the *jowhir*, or watering of the blades.

Damask. Steel worked in the Damascus style, showing the wavy lines of the different metals; usually termed watered or twisted.

Damber. An old word for lubberly rogue.

Damelopre. An ancient flat-floored vessel belonging to Holland, and intended to carry heavy cargoes over their shallow waters.

Dammah. A kind of turpentine or resin, from a species of pine, which is used in the East Indies for the same purposes to which turpentine and pitch are applied. It is exported in large quantities from Sumatra and Bengal, and other places, where it is much used for paying seams and the bottoms of vessels, for which latter purpose it is often mixed with sulphur, and answers admirably in warm climates.

Dampier, William. Born in Somersetshire, England, 1652. Beginning life before the mast and involved during the earlier part of his career in many questionable enterprises, Dampier sailed about in the Atlantic and Pacific Oceans until 1699, when he was taken into the service of the king of England and sent out on a voyage of discovery. He was chiefly engaged in exploring the northern coast of New Holland and the islands in the East Indian Archipelago. The results of his explorations and voyages were published and are still extant. The most notable is entitled "A Voyage round the World."

Damsel. A name for the skate-fish.

Dancers, The Merry. See AURORA BOREALIS.

Dandies. The rowers of the budgerow boats on the Ganges.

Dandy. A sloop or cutter with a jigger, on which a lug-sail is set.

Dank. Moist; moldy.

Danskers. Natives of Denmark.

Dantzic. Capital of the government of the same name, province of West Prussia, situated on the left bank of the Vistula, 3½ miles from its mouth. The river is here joined by the Mottlau and Radaune. Lat. 54° 21′ 4″ N.; lon. 18° 39′ 34″ E. The city is nearly of circular form, and ranks as a fortress of the first class, being surrounded by walls and bastions, defended by a citadel and outworks, and provided with the means of laying a part of the surrounding country under water. Among the public edifices are a school of navigation, navy-yard, and an arsenal. Vessels drawing eight or nine feet of water can reach the city; others lie in the Neufahrwasser, at the mouth of the river, or in the roads, which afford good anchorage for vessels of any burden. The proper port of Dantzic is Neufahrwasser, at the mouth of the Vistula, the number of sand-banks which encumber the river, immediately above seriously obstructing the navigation. Pop. 98,000.

Dar. A fish of the genus *Leuciscus;* called also *dace* and *dart.*

Darbies. A cant word for irons, or handcuffs.

Dark, or Colored Glasses. Shades fitted to instruments of reflection for preventing the bright rays of the sun from hurting the eye of the observer.

Darks. Nights on which the moon does not shine,—much looked to by smugglers.

Darning the Water. A term applied to the

action of a fleet cruising to and fro before a blockaded port.

Darsena. An inner harbor or wet-dock in the Mediterranean.

Dart. A sort of fish; the dace (*Leuciscus vulgaris*). See DAR.

Dartmouth. A town of England, county of Devon, on the west side of the estuary of the Dart, 32 miles S.W. of Exeter. The town is picturesquely built on a steep bank, forming a succession of terraces, and its dock-yard and quay project into the river. The Dart is defended at its mouth by a castle and strong batteries, and is navigable to the town. Pop. 5500.

Dash. The present with which bargains are sealed on the coast of Africa.

Dash-board. A term sometimes applied to a screen placed at the bow of a steam-launch, to throw off the spray when running rapidly through rough water. A spray-board.

Dash-pot. A device for easing a cut-off valve of a steam-engine to its seat when it is "tripped" or detached from the positive motion of the valve-gear and allowed to return to its seat or position of rest by the force of weights, springs, steam, or atmospheric pressure. The liquid dash-pot consists of a cylindrical vessel fitted with an air-tight plunger or piston, which is attached to the cut-off valve and moves with it, and when near the end of its descent, or position of rest, after being "tripped," impinges upon water or other liquid, the escape of which is so regulated as to permit the valve to settle gently to its seat, avoiding destructive shocks. When the plunger is withdrawn from the chamber by action of the valve-gear a partial vacuum is formed, and when it is released by the cut-off gear the atmospheric pressure causes its instantaneous return. In the Corliss engine an air-cushion is used, the valve being closed by the action of powerful springs. See CUT-OFF.

Data (Lat. from *dare*, to give). Things given or admitted. In problems the *data* are the known quantities from which are to be found the unknown quantities.

Datoo. The west wind in the Strait of Gibraltar. A Malay name for each one of the four officers who form the council of the sultan of the Malaya Islands.

David's Staff. A kind of quadrant formerly used in navigation.

Davie. An old term for davit.

Davis, Charles Henry, Rear-Admiral U.S.N. Born in Boston, Mass., January 16, 1807. Appointed midshipman, August 12, 1823; commissioned as lieutenant, March 3, 1834; commander, June 12, 1854; captain, November 15, 1861; commodore, July 16, 1862; chief of Bureau of Navigation, July 17, 1862; rear-admiral, February 7, 1863. From 1844 to 1849 he was engaged in the U. S. Coast Survey. In 1846–49, while surveying the waters about Nantucket, he discovered the New South Shoal and several smaller shoals directly in the track of ships sailing between New York and Europe, and of coasting-vessels from Boston. He was subsequently engaged in examining the state of the harbors of Boston, New York, Charleston, etc. These investigations led him to the study of the laws of tidal action. See his "Memoir upon the Geological Action of the Tidal and other Currents of the Ocean" (Memoirs of the American Academy, new series, vol. iv.), and "The Law of Deposit of the Flood-Tide" (Smithsonian Contributions, vol. iii.). He founded the "American Nautical Almanac," superintending it from 1849 to 1856, when he was ordered to naval service in the Pacific, in command of the sloop-of-war "St. Mary's." He was fleet-captain in Dupont's expedition against Port Royal, and second in command, and was assigned to the Mississippi Flotilla. May 9, 1862, he was appointed flag-officer of the flotilla, and on the 11th repulsed an attack by the rebel fleet. June 8, he attacked the rebel fleet opposite Memphis, capturing or destroying all but one vessel. The surrender of Memphis immediately followed. He then joined Admiral Farragut, and was engaged in the various operations above Vicksburg. With Gen. Curtis, he operated up the Yazoo in August, 1862, with complete success. Superintendent Naval Observatory, Washington, 1865–67; commanded South Atlantic Squadron, 1867–69; LL.D., Harvard College, 1868; superintendent Naval Observatory, 1870–77. Died at Washington, D. C., in 1877. Author of an English translation of Gauss's "Theoria Motus Corporum Cœlestium," Boston, 1858, and of some shorter translations and articles on mathematical astronomy and geodesy.

Davis, John, an eminent navigator of the latter part of the 16th century, was born at Sandridge, near Dartmouth, and is principally distinguished for having, between 1585 and 1588, undertaken three voyages to the northern seas in search of the northwest passage. In the first voyage he sailed as far north as the 73d degree of latitude, and discovered the strait which bears his name. He afterwards made five voyages to the East Indies, in the last of which he was killed in a fight with some Japanese on the coast of Malacca in 1605. "The World's Hydrographical Description, wherein is proved that the World in all its Zones, Climates, and Places is Habitable and Inhabited, and the Seas likewise universally Navigable" (London, 1595), and "The Seaman's Secrets, wherein is taught the Three Kinds of Sailing, Horizontal, Paradoxal, and Sailing upon a Great Circle" (London, 1595), are the two principal works written by Davis, but he was also the author of several others.

Davits. The *boat-davits* are pieces of iron or wood projecting over the side or stern; to them are attached the falls for hoisting the boats. They are supported by guys, spans, topping-lifts, and strong-backs, and are fitted in a variety of ways that the boats may be landed on the rail, swung in on deck, topped up to be secured for sea, rigged out for lowering, etc. They are sometimes so fitted that one pair supports two boats. A *fish-davit* was formerly used in fishing the anchor. It was a perpendicular spar temporarily stepped abaft the bill-board, and was supported by guys, bill-tackle, topping-lift, and jiggers.

Davy Jones. The spirit of the sea; a sea-devil.

DAVY JONES'S LOCKER. The ocean,—the common receptacle for all things thrown overboard. *Gone to Davy Jones's locker*, dead, buried at sea.

Daw-fish. The *Scyllium catalus*, a small dog-fish.

Dawk-boat or Dak-boat. An East Indian mail-boat.

Day. The time occupied by a complete revolution of the earth on its axis. Some point must be chosen to mark the commencement of a day, and the choice gives rise to several different days which differ from each other slightly in length. The scientific term "day" is never used in the sense of *day* opposed to *night*.

Day, Astronomical. The day used by astronomers to which to refer their observations, being distinguished from the *civil* day which regulates the ordinary business of life. The astronomical day begins at noon and ends at noon, its hours being reckoned from 0^h to 24^h; the civil day begins at midnight and ends at midnight, its hours being reckoned through twice 12. The astronomical is later than the civil day by 12 hours. The cause of this inconvenient difference in the modes of reckoning is, that astronomers carry on their observations chiefly at night, and if they, therefore, adopted the civil method of reckoning, they would have to change the date at midnight, the former and latter portions of every night's observations belonging to two differently numbered civil days of the month. It has, however, been questioned whether this inconvenience would be as great as that resulting from the present neglect of uniformity in reckoning time. According to the point of definition chosen the astronomical day is either a *sidereal day*, an *apparent solar day*, a *mean solar day*, or a *lunar day;* the term, when used alone, is usually understood to refer to the *mean solar day*. Reckoning in mean solar time, which is the same as civil time, a mean solar day is 24^h, a sidereal day $23^h\ 56^m\ 4.09^s$, and a lunar day, $24^h\ 0^m\ 54^s$.

Day, Circumnavigator's. A ship sailing westward runs away from the sun in his diurnal course, and, when she has circumnavigated the globe, the sun will evidently have crossed her meridian once less frequently than if she had remained stationary. On the contrary, a ship sailing eastward meets the sun in his diurnal course, and, when she has circumnavigated the globe, the sun will evidently have crossed her meridian once more frequently than if she had remained stationary. Hence a westwardly circumnavigator loses a day in his reckoning, an eastwardly circumnavigator gains a day. The alteration of the date, by inserting a day or leaving out one, in the ship's log-book should be made on crossing the meridian of 180°.

Day, Civil. The day used for the ordinary purposes of life. The motion of the sun in the heavens, bringing the alternations of light and darkness, determines generally our social arrangements, and time being kept by mechanism, the day must be of invariable length. Hence the civil is of the same length as the mean solar day. It differs, however, from the astronomical mean solar day in the following points. The astronomical day begins at noon and ends at noon, its hours being reckoned from 0^h to 24^h; the civil day begins at midnight, and its hours are reckoned through twice 12, from midnight to noon (ante meridiem, A.M.), and then from noon to midnight (post meridiem, P.M.). The commencement of the astronomical day is placed 12 hours later than that of the civil day.

Day, Intercalary. The day that is intercalated or inserted in the calendar in leap-year to make up for the odd hours, minutes, and seconds of the tropical year which have been left out in making the civil year to consist of 365 integer days. See Calendar.

Day, Lunar. The time elapsed between two successive transits of the moon over the meridian.

Day, Nautical, or Sea. This begins at noon, 12 hours before the civil day and 24 hours before the astronomical day. It is now little used.

Day, Sidereal. The interval between two successive transits of the first point of Aries over the same meridian. This is called a *sidereal* day, although not strictly determined by the stars; but the very slow motion of the first point of Aries relatively to the stars makes this day practically the same as if a fixed star had been taken, for if two clocks be set, the one on the first point of Aries, the other on the fixed star, so as always to mark $0^h\ 0^m\ 0^s$ when the *point* or the *star* respectively comes to the meridian, the difference of the two clocks would only be about 3^s in a whole year. The length of the sidereal day in mean solar time (which is the same as civil time) is $23^h\ 56^m\ 4.09^s$.

Day, Solar. The interval between two successive transits of the sun's centre over the same meridian. The *apparent solar day* is the interval between two successive transits of the actual sun's centre over the same meridian; it begins when that point is on the meridian. The apparent solar day is variable in length from two causes: first, the sun does not move uniformly in the ecliptic,—its apparent path sometimes describing an arc of 57′, and at other times an arc of 61′ in a day; secondly, the ecliptic twice crosses the equinoctial,—the great circle whose plane is perpendicular to the axis of rotation,—and hence is inclined differently to it in its different parts; at the points of intersection the inclination is about 23° 27′, at two other limiting points they are parallel. A uniform measure of time is obtained by the invention of the *mean solar day*, which is the interval between two successive transits of the *mean sun* over the meridian. This fictitious body is conceived to move in the equinoctial with the mean motion of the actual sun in the ecliptic. The length of the mean solar day is the average length of the *apparent solar days* for the space of a solar year.

Day-book. An old name for the log-book.

Day's Work. The work of computation required in navigating a ship for every twenty-four hours; the term is generally restricted to the dead-reckoning. At each noon the latitude, longitude, and the course and distance made good are wanted, together with the compass course to be steered during the next twenty-four hours. The data for this work are the latitude and longitude at the preceding noon; the compass courses and distance run on each course during the twenty-four hours; the variation and deviation of the compass; particulars of the force and direction of the wind and the consequent leeway, and the set and drift of the current.

D-block (*obs.*). An oak block of the shape of the letter D, bolted to the ship's side in the channels for the lower lifts.

Dead-calm. A total cessation of wind; a *flat-calm*.

Dead Centre or Dead Point. In single steam-engines, a position of the moving parts when the

piston is at either extreme end of its stroke, and the axis of the connecting-rod, crank-pin, and shaft lie in the same plane. From this position it is impossible to start an engine at rest by piston-pressure, and it becomes necessary to "jack" or turn some rotative part by external force. When the engine is once in motion these points are passed by the momentum of the rotating parts. Double engines are connected by cranks placed at such an angle one with the other that one only can arrive at the dead point at the same instant.

Dead-door. A door fitted to the outside of the quarter of a ship, to keep out the sea in case the quarter-gallery should be carried away.

Deaden. To retard, or render less; as, to deaden a ship's headway.

Dead-eye, or Dead Man's Eye. A piece of hard wood of oblate form having three holes, through which is rove the laniard for setting up the backstays and lower and topmast rigging. The laniard is rove through two dead-eyes, forming a threefold purchase; the lower dead-eye is shackled to the chain-plate, and the upper one is secured to the shroud. There are several ways of securing the dead-eye to the shroud, viz.: splicing, turning in by the old method, turning in cutter-stay fashion, and turning in by the present mode, in which, instead of being taken around the dead-eye itself, the shroud is taken around a heavy iron thimble bolted to the iron strap of the dead-eye.

Dead-flat. In ship-building, the name of the widest frame in the ship.

Dead-freight. The sum to which a merchant is liable for freight which he has failed to ship.

Dead-head. A rough block of wood used as an anchor-buoy.

Dead-headed. A word applied to trees which have ceased to grow.

Dead-horse. Wages paid before they are earned. In some merchant ships when the dead-horse has been worked off, *i.e.*, when the men have served long enough to earn the money advanced, they perform the ceremony of dragging the effigy of a horse around the deck, running him up to the yard-arm and cutting him adrift to fall into the sea.

Dead-lift. The lifting of a thing at the utmost disadvantage.

Dead-lights. Strong wooden shutters made exactly to fit the cabin ports, into which they are fixed on the approach of a storm, the glass sashes being taken out.

Dead-lown. Dead-calm.

Dead-men. The ends of gaskets and points left dangling under the yards, which should have been tucked in when the sail was furled.

Dead Men's Effects. When a seaman dies on board or is drowned his effects are sold at the mast by auction, and the produce charged against the purchasers' names on the ship's books.

Dead Months. A term for winter.

Dead-on-end. A term applied to the wind when it comes exactly from the point to which the ship is to steer.

Dead-pay. See DEAD-SHARE.

Dead-reckoning. The method of determining the ship's position without the aid of astronomical observations.

Dead-rise. The rise of the floor of the ship from a level, usually taken on the midship frame in inches or degrees from the centre line.

DEAD-RISING. An elliptical line drawn on the elevation plan, or profile of the ship, to determine the sweep of the floor-heads throughout the ship's length. Sometimes called *rising-line.*

Dead-rope. Ropes which do not run through any block.

Dead-share (*Eng.*). An allowance formerly made to the officers of the fleet from fictitious numbers borne on the books, varying from fifty shares for an admiral to half a share for the cook's mate.

Dead-sheave, or Dumb-sheave. An aperture in which a rope travels, and which has no sheave.

Dead Steam. Steam possessing sufficient heat to retain it in a state of vapor at any tension, but incapable of performing work without condensation; this may be observed in boilers with "banked" or very low fires.

The exhaust steam from a non-condensing engine when used for heating purposes.

Dead-water. The eddy-water under the counter of a ship under way; so called because it passes away slower than the water alongside.

Dead-weight. A vessel's lading when it consists of heavy goods; particularly such as pay freight according to weight.

Dead-wood. That part of the ship which is built forward and abaft the square frames of the ship, in wooden ships, upon which the cants are stepped and secured. It is firmly bolted, both to the keel and stern-post aft, and to the keel and stem forward.

DEAD-WOOD-KNEE is the first piece of the after dead-wood, and is placed as a large knee (in wooden ships), with the arm against the stern-post and the body upon the keel, and it is secured to both with heavy bolts.

Dead-works. All that part of the ship above water when she is laden.

Deal. A town of England, county of Kent, a member of the Cinque-port of Sandwich, from which town it is 5 miles S.E., on the shore of the North Sea, near the S. extremity of the Downs, 8 miles N.N.E. of Dover. The principal buildings are a court-house, naval store-house, barracks, hospital, and custom-house. At the S. and N. extremities of the town are Walmer and Sandown Castles, and intermediate is Deal Castle, built by Henry VIII. The inhabitants are mostly connected with maritime traffic, and the skill and boldness of Deal pilots are proverbial. Pop. 8100.

Deal. Pine and fir boards or thin plank.

Deal Beach (*Eng.*). This beach consists of gravelly shingle; a man who is pock-marked is said to have rolled on Deal beach. See CHOP-DOLLAR.

Deal-ends. Deal-planks under 6 feet in length.

Death. If the commander-in-chief be killed in battle he is succeeded by the line-officer next in rank on board the flag-ship, until the senior officer of the fleet announces that he has assumed command. The flag of the deceased is kept flying until the battle is decided.

If the commanding officer die, he is succeeded by the line-officer next in rank, until relieved by orders from the commander-in-chief, or Navy Department, even though there be officers on

board, as passengers, of higher rank. On the death of the paymaster of a vessel or station the commanding officer appoints a suitable person to take charge of the money, books, and stores, and to perform the duties of the paymaster until otherwise directed by competent authority.

On the death of any person in the naval service the medical officer is required to make a report, in which is stated distinctly the circumstances under which the death occurred, and whether or not in the line of duty. See FUNERAL HONORS.

Death, or Money Boats (*Eng.*). Long narrow boats used by smugglers in the English Channel.

Death-wound. A law-term for the springing of a fatal leak. A ship had received her death-wound, but by pumping was kept afloat till three days after the time for which she was insured; it was decided that the risk was at an end before the loss happened, and that the insurer was not liable.

Debark. To land; to go ashore.

Decatur, Stephen, son of Capt. Stephen Decatur, was born on the 5th of January, 1779, at Sinnepunxit, Md. Entered the navy in March, 1797, as a midshipman, and joined the "United States," Capt. Barry, cruising in the West Indies. Promoted to lieutenant in 1799, and cruised in the brig "Norfolk," 18, returning to the frigate "United States" in 1800. Sailed as first lieutenant of the "Essex," in Dale's squadron to Algiers, in 1801–2, returned, and ordered to the "New York," 36, again going to the Mediterranean. In the fall, on his return, took the "Argus" out to the same squadron, and was transferred to the command of the "Enterprise." Had command of the force that destroyed the "Philadelphia," taking the ketch "Intrepid," which he had captured. For valor in this was promoted to captain in 1804, and a sword given him. Commanded a division of boats in an attack on Tripolitan gunboats, August, 1805, where he was wounded in a personal combat, but captured two prizes. Commanded the "Constitution," and engaged in attacks of 28th of August and 3d of September. In November transferred to the "Congress," sent to interview the Bey of Tunis, and carried to the United States his minister. Employed on shore 1806–7, and given command of the "Chesapeake," superseding Barron. But in 1811 he hoisted his broad-pennant in the "United States," 44, and captured the English sloop "Macedonian," October 25, 1812, in a brilliant engagement. Entering New York with his prize, he was blockaded, and his ship laid up, when he was given the "President," 44. He sailed in January, 1815, but was captured by an English fleet on the 14th. Commanded a fleet sent to Algiers in May, 1815, in the "Guerriere," 44, and on the 17th of June captured the "Mashouda" with the Algerian admiral. Arrived home November 12, 1815, having obtained reparation from the Barbary powers. Was a Commissioner of the Navy from 1817 to 1819. He having opposed Barron's having a command, a difficulty ensued, and a duel was fought, March 22, 1820, when Decatur was mortally wounded, and died the same day, aged 41.—*F. S. Bassett, Lieutenant U.S.N.*

Décimètre (*Fr.*). One-tenth of a mètre, and equal to 3.937 English inches.

Deck. The planking placed upon the deck framing which makes a continuous platform, fore and aft the ship. The deck is said to be a Thasian invention, and was at first used as a protection for the rowers. A deck may extend from the stem to the stern; as, the gun-deck; or be but partial; as, the deck of a topgallant forecastle. The *upper*, or *spar-deck* extends from stern to stem; the part of the spar-deck from the mainmast aft is the *quarter-deck;* when there is a poop-cabin, the deck which protects it is called the *poop*, or *poop-deck;* it extends from the mizzen-mast aft. A *gun-deck* is a deck below the spar-deck on which guns are carried. The *berth-deck* is a deck next below the gun-deck, on which are stowed the bags, etc., and on which are swung the hammocks of one watch. The *orlop-deck* is the deck on which the cables are stowed; it is below the water-line. The *half-deck* is that portion of the deck next below the spar-deck, from the mainmast to the cabin-bulkheads. In a three-decker, the three gun-decks are called the *main*, *middle*, and *lower* decks. In river-steamers the *boiler-deck* is the one on which the boilers are placed, and the *hurricane-deck* is the upper deck.

DECK-BEAM. One of the heavy pieces of timber extending across the ship on which the decks are laid.

DECK-BEAM KNEE. Any one of the knees in the deck framing, either a lodge or a lap knee, which is secured to the beam by its arm.

DECK-CARGO. See DECK-LOAD.

DECKER. According to the number of gun-decks a vessel has, she is distinguished as a single-decker, two-decker, or three-decker.

DECK, FLUSH. One in which there is no break.

DECK-HOOK. A large knee either forward or aft, which is placed, as a part of the deck framing, at the extremities, and secures both sides of the ship to each other.

DECK-LOAD. Merchandise carried on the upper deck.

DECK-PIPE. The aperture in the deck through which the cable passes from the chain-locker to the anchor.

DECK-PUMP. A pump used for pumping water for washing decks; it is worked by hand.

DECK-SEAM. The interstices between deck-planks.

DECK-SHEET. Lower and topmast stun'sails are fitted with two sheets; the one leading directly to the deck is called the *deck-sheet.*

DECK-STANDARD KNEE. A large knee of oak or iron fayed on the deck and against the side of the ship. The arm being placed upon the deck, is bolted through the beam and clinched underneath, and the other arm is bolted to the ship's side. Their use was to strengthen the sides. They are sometimes used upon wooden merchant ships, aft on the middle deck, one arm being bolted to the deck and the other arm of the knee fayed against the transoms, to which it is securely bolted.

DECK-STOPPER. See STOPPER.

DECK-TACKLE. A heavy luff or twofold purchase used for rousing in the cable, or other heavy work.

DECK-TRANSOM. The transom which comes to the same level or height of the deck at the after-end, and to which the framing of the deck is secured.

Declaration of War. See INTERNATIONAL LAW.

Declare. To make a full statement of goods, etc., for the purpose of paying custom-house duties.

Declination. The angular distance of a heavenly body from the equinoctial; it is reckoned from 0 to 90° north or south. The complement of the declination is the polar distance.

DECLINATION, CIRCLE OF. See CIRCLE.

DECLINATION, PARALLEL OF. A circle of the celestial sphere parallel to the equinoctial.

DECLINATION OF THE COMPASS-NEEDLE. A term sometimes used for the *magnetic variation* of the compass-needle.

Decoy. The appearance of a man-of-war is sometimes changed by striking topmasts, setting ragged sails, painting, etc., to induce a vessel of inferior force to chase, and thus come within gunshot.

Decrès, Denis. This distinguished French naval officer was born in 1762, and died in 1820. Entering the French navy at the age of 17, he first served in the fleet of Count de Grasse, and in the battle of April 12, 1782, in the West Indies, he won his promotion to ensign, although the fortune of the day was against the French.

From this time his promotion was rapid, as he distinguished himself in the frigate squadron which France sent to the East Indies.

In 1793 he was a "capitaine de vaisseau," but was deprived of his rank, and imprisoned by the revolutionists because he was a noble. Escaping more easily than thousands of others, he was at last released, and restored to his rank in the navy, in 1795. In 1798 he had reached the rank of rear-admiral, and in that capacity assisted in the capture of Malta.

After this he served at the battle of Aboukir, and led back to Malta the few French vessels which escaped from that action, and these were soon blockaded by the English in the harbor of Valetta. Decrès, in conjunction with Gen. Vaubois, conducted the defense of Malta, which lasted seventeen months. In March, 1800, provisions falling short, and much sickness appearing in the French garrison, Decrès embarked about 1200 men on board the "Guillaume Tell," and forced the blockade. The English frigate "Penelope" followed him, and next day the "Guillaume Tell" fell in with the English ship "Lion," 64, a sanguinary action ensuing, during which Decrès boarded the "Lion" twice, but was each time driven off. The "Lion" at last hauled off to repair damages, and just then the English "Foudroyant," 86, came up, and the "Tell" sustained an hour's fight with her, the "Lion" coming again into the action. Decrès tried boarding the "Foudroyant," but unsuccessfully, and the "Guillaume Tell" was obliged to surrender. Decrès was wounded by an explosion, as were his captain and several of his officers, while nearly half his crew were killed or wounded. The frigate "Penelope" was able to take the dismasted "Tell" in tow, and reached Syracuse, while the two larger English ships with great difficulty got to Mahon. For this hard-fought action Decrès received a sword of honor from the First Consul, and the English "Naval Chronicle" states that his was the warmest resistance ever made by a foreign man-of-war against a superior British force. Decrès, upon his return from captivity in England, was successively appointed préfect maritime, commandant of the western fleet, and minister of marine. He continued to act in the latter capacity as long as the empire lasted, showing great administrative ability.

During his administration the great works at Cherbourg were materially advanced, as well as those at Nieuwe-Diep, and Flushing, while the docks and ship-yards of Antwerp were wholly created. He managed to keep up and even increase the strength of the French navy in spite of their great losses at sea, and collected the great flotilla of Boulogne which events, however, rendered useless. Napoleon, who made him in succession a count, grand cross of the Legion of Honor, and finally a duke, recalled him to his old position during the Hundred Days, and when the emperor finally fell, he was retired by the Bourbon government.

Duke Decrès survived many bloody battles to be at last assassinated by his valet. This man, who had for a long time been robbing him, placed a quantity of powder, with a slow match, between his mattresses. Stealing into the duke's bedroom in the night, he blew him up. The valet, in his fright and perturbation at what he had done, threw himself out of the window and was killed; his master died a few days after, aged 58 years.—*E. Shippen.*

Deep. Lying far below the general level; of great perpendicular dimension, conceived of as measured downward. The word is figuratively applied to the ocean; as, "Neptune, the monarch of the deep." A vessel is loaded *deep* when her cargo causes her to be much immersed in the water; she sails *deep* when her expenses run high. See MARKS AND DEEPS.

DEEPEN. The water *deepens* in running from shoal into deep water.

DEEP-SEA LEAD. The sounding-lead used in deep water. See LEAD.

DEEP-SEA LINE. The line attached to the deep-sea lead. See LEAD.

Deep-sea Sounding. From the beginning "when the waters were gathered together unto one place," until within the latter half of the 19th century, the depth of the sea has been a mystery which in every phase and epoch of civilization baffled the skill and patience of the seaman, the quest and genius of the philosopher, the curiosity of the idler, and the impracticability of the dreamer; but so great has been the fascination of the problem that probably no one ever got on blue water, however careless of other aspects of nature, who did not dream and ponder over the seemingly impenetrable mystery that lay below, and long for the seal to be broken, that a glimpse at the secret of the ages might be given him. Indeed, so great and continuous had been the failure of skilled and experienced seamen, of every name and nation, to fathom the depths and get answer to their anxious questioning, that it had come to be a popular belief the ocean was quite bottomless in some places; that the weight and pressure of the superincumbent water increased the density of the lower strata to such a degree that things thrown into the sea floated at different levels, according to their specific gravity; that below a certain depth a temperature of 39° F. was uniformly found; and that no animal life could exist on the lower

planes and valleys of the ocean-bed. And, when it is considered that the pressure for every mile below the surface is a ton per square inch, it is not to be wondered at that such notions prevailed in the general mind, prone to forget that water is practicably incompressible.

The great difficulty of sounding in "blue water" arose from the fact that, as the plummet descended, the weight of the line, and its running out, retarded by the attendant and ever-increasing friction, and diverted by the action and freaks of submarine currents, neutralized, as it were, the momentum of the lead, playing havoc with its indications, and making it impossible to tell with any degree of certainty the moment of touch bottom beyond a depth of 800 or 1000 fathoms; especially as the line, made doubly heavy by its absorption of water, would continue to run out simply from its own weight long after the sinker had buried itself in the ocean-bed, and, with the life stretched out of it, often broke in hauling back; hence the work of hours on such occasions appeared only to demonstrate the seeming impossibility of getting at the depths, and the most extraordinary results were reported and accepted, as, for instance, where Capt. Denham, R.N., assumed that he had made a reliable sounding at a depth of more than 8 statute miles in the South Atlantic; or where Lieut. Parker, U.S.N., reported an attempt made in the same ocean off the coast of Brazil with 50,000 feet run off the reel-sounding from a boat, without, as he thought, getting bottom; or where Capt. Ringgold, U.S.N., reported finding a depth of 9 statute miles in the Indian Ocean, 1855, using the apparatus known as the Brooke.

In these efforts to measure the depths, distinguished naval officers of the principal maritime powers vied with one another in their endeavors to penetrate the secrets of the ocean-bed, but the impartial student, of whatever nation, will accord the U. S. naval service and Coast Survey merited prominence in diligent and persistent effort, inventive appliance, and intelligent adaptation of ideas and methods, from whatever source, towards the satisfactory solution of the problem. It was the good fortune, however, of Sir William Thomson, of Glasgow University, distinguished in many fields of science, and especially for his inventions making practicable ocean telegraphy, to conceive the best and simplest means of measuring the depths; and today, thanks to his genius, it is as easy for the questioning seaman or scientist to bring back answer from the depth of five miles as it formerly was from a depth of a quarter of a mile. The general mistake made by the indefatigable seekers was in allowing the line to run out too freely as the plummet descended, as will be seen farther on. It was difficult, too, to keep the old sailing-craft in position, owing to drift, heave of sea, and constant motion of the vessel, obstacles well-nigh overcome in these later days of research, when steam has come to the aid of the laborer in every field; and nowhere does the masterful power of that fierce agent find better illustration than in its triumphs on the restless and turbulent sea, enabling the seaman to do now with ease and certainty what would have been regarded as impossible and visionary half a century ago. In a paper, prepared by the writer for the American *United Service* magazine in 1879, it was stated that the first attempt made to sound with wire was from H. M. S. "Thunder," Capt. Barnett, R.N., August, 1849. This was an error; most, if not all the vessels of the U. S. Exploring Expedition, which sailed from Norfolk, Va., in 1838, under command of the late Rear-Admiral Charles Wilkes, then a lieutenant, were supplied with copper wire, about 3.32 of an inch in circumference, the splices twisted and soldered.

In trying the wire on board the "Relief" of that expedition, it parted when some 500 fathoms were out; on board the flag-ship "Vincennes" the soundings were somewhat deeper, but the results were generally unsatisfactory, owing to constant losses of wire; and before the expedition was on its homeward route, 1842, its use was abandoned. The wire used on board the "Thunder" was of iron, varying in size from Nos. 1 to 5, the sinker weighing 61 pounds. Only one trial was made, and the wire broke at 2000 fathoms. It had run out in twenty minutes, fifty-three seconds; rapid work, indicating that no restraint had been put upon the reel, and the break was doubtless due to the parting of a splice, or a jerking strain caused by the rolling of the ship; this attempt was made between the banks of Newfoundland and the Western Islands. Three months later, the same year, 1849, the U. S. schooner "Taney," Lieut. J. C. Walsh commanding, experimented with steel wire in the vicinity of the Bermudas. The wire broke when 5700 fathoms had run out, and Walsh reported no bottom at that great depth; the fact was that bottom had been struck when half the wire had run out, as subsequent soundings have shown. The wire was of three sizes, Nos. 5, 7, and 8, Birmingham gauge, and its average weight in water about 180 pounds to the mile. It was wound on an iron reel, controlled by brakes and friction-bands, and swivels were fitted next the sinker and at every thousand fathoms, to counteract the tendency to twist. The lengths were marked with copper labels, and the sinker weighed only 10 pounds; but 6 pounds more should be added for the weight of the registering-machine devised by Maury and used on this occasion. The sinker was obviously too light, for with less than 200 fathoms out, the weight of the wire, the No. 5 size being 0.22 inch in diameter, would already exceed that of the lead, and the momentum and influence of the latter be swallowed up, as it were. Had the sinker weighed 400 pounds, which the size and strength of the wire seemed to admit, the trial would doubtless have been successful, taking it for granted that the descent was controlled by the friction-brakes.

Other trials were made from the "Taney," but with no better results, the wire generally parting at 2000 fathoms. Walsh does not seem to have mentioned the cause of these repeated losses, and in the midst of his experiments he found the vessel unseaworthy and had to return home, under convoy of the U. S. brig "Porpoise," 1850, the present Rear-Admiral B. F. Sands, U.S.N., commanding, the writer serving on board his first cruise as midshipman, little dreaming that he himself was to become somewhat identified with deep-sea exploration later on. These experiments with wire in our own and the English service, seem to have convinced

the naval mind of the uselessness of further attempt in that direction, and the idea slumbered until awakened by the magic touch of Sir William Thomson's hand twenty-three years later, transforming failure into pre-eminent success.

Nothing daunted at these repeated failures, the U. S. Coast Survey, under the able superintendence of the learned and energetic Bache, kept actively at work surveying the coasts of the Atlantic, Pacific, and Gulf of Mexico, exploring the Gulf Stream for depths and temperature, and devising new methods and appliances for the advancement of hydrographic science; while Maury, the father of the science of the physical geography of the sea systematically pursued, and superintendent of the National Observatory, and in charge of all matters pertaining to navigation under the cognizance of the Bureau of Ordnance and Hydrography at that period, 1850, stimulated effort on the part of the naval service.

Be it said in passing that as, with the exception of the period embraced by the civil war, the greater part of the hydrographic work of the Coast Survey has been done by naval officers, both branches of the service may be considered as twin sisters in that regard; and, indeed, the navy claims to be the elder of the twain in all that pertains to the prestige of skilled achievement, inventive genius shown, and well-earned reputations made, in the conduct of that great national work which maps the way for the mariner all along a magnificent coast-line of more than 13,000 miles, and puts into the hands of the scientist the data which, in some measure, tell the earth's ancient story.

Now discarding both wire and rope, the U. S. naval service, at the instance of Maury, adopted the use of flax twine of exceptional strength, weighing a little less than 9 pounds to the statute mile, wound on light running reels in lengths of 10,000 fathoms. 32-pounder shot were selected for sinkers as available in every ship of war at that period, 1850. These reels of twine were supplied every cruiser asking for them, but the first approach to success with such appliances was on board the U.S.S. "Albany," Commander Platt, in the Gulf of Mexico, and under the supervision of Lieut. (now Rear-Admiral) Wm. Rogers Taylor.

Taylor tried and adopted the method of time intervals as a help in interpreting the time of the arrival of the lead on the bottom, and though much discouragement resulted from frequent losses of twine, he was pretty confident of having measured the depths with tolerable accuracy; but no sinkers had been hauled back, owing both to weak places in the twine and the wonderful retarding influence of friction, which, though somewhat diminished by waxing the twine, was not enough to more than partially overcome the difficulty.

Some question has arisen as to who originated the method of "time intervals," but it would seem that Capt. James F. Ross, R.N., noted the intervals March, 1840, sounding the Cape of Good Hope from H. M. S. "Erebus" in 2677 fathoms. The cast seems to have been made from boats, the reel of 5000 fathoms line probably rigged between them. The first length of line of 437 fathoms next the sinker, which weighed 540 pounds, was of a single strand of whale-line, the rest of two strands of spun yarn. Capt. Crozier kept the time of descent. "When the weight struck bottom," says Ross, "it stopped so suddenly that the boat's crew all called out 'it is down.'" The great weight of the sinkers in proportion to the size of line was a notable step towards the solution of the problem, and it is surprising that later explorers did not follow more closely this experience in that regard. The noting of the intervals does not seem to have been with a view to the interpretation of the final result; the great weight of the lead was depended upon for that; and, continues Ross, with pardonable glow, "nothing could be more satisfactory than this sounding, and it is the more so that we have the means of getting soundings however deep the sea may be." Yet despite this rose-colored view how much discouragement subsequently resulted to other workers! The fault seems to have been in a lack of system, which did not give sufficient heed to the experience of explorers of different nationalities and at various periods. Capt. Barnett, too, of the "Thunder," marked the intervals, sounding in the North Atlantic, 1849, but Taylor seems to have been the first officer to deduce from the rate of descent a rule whereby to signal with some degree of accuracy the arrival of the lead on the bottom, which rule observed by Lee and Berryman, and perfected by Spratt and Brooke, has been the main reliance in determining the accuracy of deep-sea work until the Thomson machine superseded and rendered such method practically obsolete. A notable exception to this, however, has been the continued use of the time-interval interpretation by the "Challenger" in her recent famous expedition around the world.

But to return. Tables were constructed for different weights of sinkers and sizes of lines, showing the rate of descent of each 100 fathoms, and any marked or disproportionate increase in the intervals of time would indicate the reaching of bottom; but the observer would need to watch the line sharply and become very familiar with all the indications to interpret correctly the moment of touch; hence a good deal of line often ran out before it was discovered that the lead was on the bottom, and some of the soundings reported by Lee and Berryman were in excess of the actual depth as subsequent research has shown. While these experiments on board the "Albany" were still in progress, Lieut. (now Rear-Admiral) S. P. Lee sailed from New York, October, 1851, in the "Dolphin" brigantine, having been detailed for the special duty of "testing new routes and perfecting the discoveries made by Lieut. Maury in the course of his investigations of the winds and currents of the ocean," and he was instructed to make deep-sea soundings in favorable weather. The sounding apparatus supplied was similar to that tried on board the "Albany," modified and improved by the experience of that vessel; but Lee adopted the idea of sounding from a boat instead of from the deck of the brig, believing that by means of her oars the boat could be readily kept over the line and give a plumb sounding, a thing quite impossible from a ship not controlled by steam. Small waxed fishing-line was used, with 32-pound shot for sinker. The line ran through a small bull's-eye, held in one hand by a quarter-

master, who gave line with the other when necessary to relieve the sinker from the resistance of the reel. The reel was mounted on a stand placed at the stern of the boat, and turned on friction-rollers. "When the shot struck bottom," says Lee, "stopped pulling, let the boat settle, and tried the currents; if the line did not part, then cut the line." No attempt was made to haul back the sinker; the principal thing considered was to ascertain the depth without reference to the character of the bottom. The verification of the sounding and the gratification of response from the ocean-bed was lacking to complete the effort, and such work could only be done in good weather, with smooth sea and all favoring circumstances. The "Dolphin" cruised eight months and made 89 deep casts, but the line parted in 34 of them, and doubt hung over the results in some others; still, it was considered good work had been done, and that the brush of difficulty had in a measure been cleared away.

Lieut. O. H. Berryman now succeeded Lee in command, and continued the work of exploration in the North Atlantic, 1852–53; and though some of his soundings were in excess of the actual depths, as has since been shown, the general results, as with Lee, were regarded as the most satisfactory and accurate that had hitherto been obtained.

The "Dolphin's" soundings developed a ridge about one-third across the Atlantic to the eastward of the Antilles, with a depth of from 1900 to 2000 fathoms over it, which has been called the Dolphin Rise. This "rise" seems to be a continuation in a south-southwesterly direction from the Azores of what is known as the telegraphic plateau discovered by Berryman. While Berryman was yet exploring in the "Dolphin," Mr. Cyrus W. Field was beginning to interest himself in the subject of ocean telegraphy, and it was to be the good fortune of Berryman to link his name with that of Mr. Field in connection with the first and most important great ocean cable laid. In the latter part of 1853, Mr. Field's aid was solicited towards the completion of the submarine line between St. John's and Newfoundland; and, enlarging the horizon of that scheme, Mr. Field obtained the grant of a charter for himself and associates to connect Europe and America by submarine cable *via* Newfoundland.

The needs of the age demanded submarine communication, and the demand, given living form and embodiment, as it were, by the energetic and prescient action of Mr. Field, quickened and stimulated effort to measure the depths; but not only the depth was required, but the character of the bottom also, for a cable made to rest on bed of ooze, sand, or clay would not do for rocky ridge or pebbly plain.

At this juncture, Passed Midshipman John M. Brooke, U.S.N., now Professor Brooke, Military Institute, Lexington, Va., came forward with his beautiful and timely invention for leaving the sinker on the bottom and bringing back a specimen of the soil from the ocean-bed. The invention consisted of a light iron rod, terminating in a cup at one end and with trigger fitted at the other, the rod passing through a hole, bored or cast, in a cannon-ball or shot of the desired weight.

In descending, the shot hung from the triggers by means of slings, and was upheld by the line made fast to the triggers above the ends of the slings. The moment bottom was struck the line would slacken, and the weight of the shot pulling down the triggers would cause the slings to slip off, releasing the shot and leaving it behind. The cup of the rod had quills fastened in it for the purpose of bringing up specimens of the bottom soil. Though the apparatus was first brought prominently forward in 1854, Passed Midshipman (now Commodore) Earl English, U.S.N., was the first person to test its capabilities in deep water, sounding from one of the "Dolphin's" boats, the brig still under Berryman's command, August 22, 1853; lat. 50° N., lon. 14° W., in 1580 fathoms, or a depth of nearly two miles, bringing up a good specimen of yellowish-white chalky clay. This was undoubtedly the first time a specimen had been brought up from so great a depth, and English states that "during the remainder of the cruise the Brooke machine was almost exclusively used, with perfectly satisfactory results."

Prior to that sounding the casts had been made as heretofore described,—the time-interval method, with no attempt to haul back the line, —"which process," English continues, "he never regarded as satisfactory or conclusive."

Other devices had been tried for bringing up specimens from as great depths as it had hitherto been possible to sound with rope, but Brooke's idea of leaving the sinker on the bottom seems to have been the first successful invention towards that end. Sir John Ross, R.N., had in Baffin's Bay, 1818, brought up specimens from 1050 fathoms with a "deep-sea clamm," invented by himself; and the late Rear-Admiral Chas. H. Davis, U.S.N., had in 1845 brought up greenish mud from 1350 fathoms, in the North Atlantic, using a Stellwagen lead, called a "cup-lead" in the English service, and the invention of Lieut. Stellwagen, U.S.N. These were non-detachable leads, however, and would not work in the deeper water. Some four years after Brooke's invention,—1857,—Lieut. (now Rear-Admiral) B. F. Sands, U.S.N., brought forward another ingenious detaching apparatus which has been preferred by some workers to that of Brooke. The Sands cup, indeed, has long been in use both in the naval service and Coast Survey.

The next important departure in deep-sea work was the equipment—at the instance of Mr. Field and associates, 1856—of the first steam-vessel fitted for such purpose,—the U. S. S. "Arctic," under Berryman's command,—for the surveying of the route for the proposed submarine cable. The "Arctic" was fitted with a steam-reel, which held 10,000 fathoms of line an inch in diameter, and the sounding was done from the bow. The Brooke was used for bottom specimens; but Berryman modified the apparatus by substituting a conical lead-sinker, weighing from 100 to 150 pounds, for the round shot. Massey's self-registering machine was used as a check on the line for vertical depth instead of noting the time-intervals of descent.

This machine is simply a small brass propeller fixed in a protecting metal frame, which, in descending, turns by action of the water, communicating its motions to the indices of several dial-plates marked in units, tens, and hundreds of fathoms, and so on. The machines furnished

the "Arctic" had their dials improved by Mr. Saxton, of the Coast Survey, to register 21,000 fathoms without re-adjustment. Similar machines had been made by M. Lecontre, Walker, and Trowbridge; but their use, except in shoaler soundings, has been abandoned, owing to doubtful results in deep water and their liability to get out of order. Berryman, however, instanced one cast in 2070 fathoms, as indicated by the "Massey," where only 2150 fathoms of line ran out; and, as the Brooke brought up a specimen, there could be no doubt of the value of the sounding as things went then.

The "Arctic" was twenty-two days in crossing the Atlantic from the banks of Newfoundland to the Irish coast, making 24 casts in all, the deepest of which was 2700 fathoms.

The soundings had sometimes to be repeated owing to breakage of the line, and two hours was the average time occupied at each cast.

Notwithstanding this good work, the discarding of the use of time intervals, carelessness in preparing profile chart of the bottom, and the publication of the results in England before report was made to the Navy Department, engendered differences—personal and official—between Berryman and Maury, which led the latter to so discredit the "Arctic's" work as to cause the British Admiralty to detail H. M. S. "Cyclops," Lieut. Dayman, R.N., to make a supplementary survey. Dayman had similar appliances to those used on board the "Arctic," but discarding the quills, fitted a valve in the specimen cup, and substituted wire for the rope or cord slings originally designed by Brooke. Brooke subsequently modified the rod so as to have only one trigger, insuring more certainty in its working. The same route was gone over, and the 34 casts made substantially agreed with those made by Berryman. The "Cyclops's" deepest cast was 2424 fathoms. Maury was obliged to accept the results of this survey, though it interfered with a theory he had put forth in his "Physical Geography of the Sea," "that there is at the bottom of this sea, between Cape Race and Cape Clear, a remarkable steppe, already known as the telegraphic plateau, . . . and the sea is probably nowhere more than 10,000 feet deep," whereas the depth was found to be considerably greater, and the bottom not so regular as had been thought. In fact, the so-called plateau is not so uniform in contour as the bed of the Pacific between San Diego and the Hawaiian Islands, or from Cape Flattery, across the Gulf of Alaska, to a point near the Aleutian chain.

Subsequently, Dayman, in the "Gorgon," sounded another route *via* the Azores, using non-detachable sinkers weighing 188 pounds, and stout albacore line, which he cut on reaching bottom. Then followed Sir Leopold McClintock in the "Bull-dog," who, in 1860, sounded on a more northerly route than either of the others. Sir Leopold adopted the novel plan of first finding the depth with stout cod-line and iron sinkers of 100 pounds, which he cut away on reaching bottom; then sending down with stouter line for specimen a detachable lead of clumsy construction, known as the bull-dog machine. Other British officers took part in these surveys in the North Atlantic, notably Capt. Hoskyn in the "Porcupine" and Lieut. Johnson in the "Greenwood."

Meanwhile, Brooke had been testing his apparatus satisfactorily in the North Pacific, in depths ranging from 2000 to 3400 fathoms. His first experiment was in January, 1854, sounding from one of the "Vincennes's" boats, using fifteen-thread twine .07 inch in diameter, and sinker—a shot—of 40 pounds weight. It was an anxious day for the enthusiastic inventor, but everything worked smoothly, and he had the great satisfaction of leaving the shot on the bottom, and bringing back a specimen from 2150 fathoms,—the first soil that delighted the eyes of the persistent seeker from so great a depth. Four years later, and now a lieutenant, and in command of the schooner "Fenimore Cooper," he continued his experiments in the same ocean.

Following up some extended and suggestive experiments by Capt. F. Spratt, R.N., made in the Mediterranean, 1857, of weighing the line when the lead was thought to be on the bottom, and tested by Trowbridge's demonstration of the laws governing the descent of line in water, Brooke deduced a rule of *standard casts*, which led to very accurate results, as is now put beyond question by the close approximation of the "Cooper's" soundings to those of the U. S. S. "Tuscarora" in the same region of the Pacific, between California and the Hawaiian group, and establishing beyond doubt the superiority of his apparatus to that of any other invented up to that time for measuring the depths; indeed, all other contrivances for leaving the sinker behind and bringing up specimens of bottom soil—and there have been many—may be said to be modifications of the Brooke apparatus.

The next extended and important exploration of the depths was made in 1868 by Capt. (now Rear-Admiral) F. P. Shortland, R.N., in H. M. S. "Hydra," who was ordered by the Admiralty to survey a cable-route from Aden across the Arabian Sea to Bombay. Shortland seems to have had a genius for deep-sea work, and his ship was undoubtedly better equipped for the purpose than any vessel hitherto engaged in such service.

The modification of the Brooke apparatus, known as the "Hydra" machine, and improved by Staff Commander Baillie, R.N., is now the favorite machine in the British service. "The original machine," says Capt. Shortland, "was a combination. Her blacksmith, Gibbs, invented the detaching spring; a tube used by Capt. Spratt when sounding in the Mediterranean suggested the tube part. The piston was a contrivance of mine in order to lessen the shock of the strike in hard bottom, and to prevent the machine from turning over on its side, in which case the suspending wire did not slack sufficiently to be disengaged." One admirable feature of the "Hydra" is that the sinker consists of several iron disks of an average weight of 100 pounds each, "toothed and notched," so as to form a compact mass when put together. The obvious advantage is that the weight can be increased or diminished at pleasure. The tube for specimen and bottom water passes through the sinker, as in the Brooke, and is divided into four chambers fitted with valves opening upward, the lower end having a butterfly-valve. In the upper chamber travels a piston, carrying a rod, to which is bent the sounding-line. The slings of the sinker depend from a stud projecting from

the upper end of the rod, and an arched steel spring, with a slit directly over the stud, is fastened to the rod longitudinally, the ends having play so that the spring can be readily pressed inward. When the sinker is suspended the spring is pressed in, and from the stud, now outside the spring, the slings are hung, the weight holding the spring back.

Commander Baillie's modification does away with the stud and spring, and substitutes a sliding "catch," the bight or loop of the slings passing over it, and when bottom is struck the "catch" drops over a conical end, the slings fly off, releasing the sinker. Shortland seems to have made the first use of the accumulator to relieve sudden strain in a sea-way and to indicate roughly the amount of strain as the line runs out. This consists of two-score or more of rubber springs rove through stout wooden disks, placed two or three feet apart, with appropriate fastenings. The lower end of the accumulator is fastened to a short pendant hooked into an eyebolt in the deck, and to the upper end is spliced a longer pendant, passing through a fair-leader on the sounding-derrick, and having a block turned in at its other end, through which the sounding-line is rove. The upper pendant is fitted long enough to permit the accumulator to stretch more than double its length, but arranged to keep it within breaking limits.

The sounding-lines of the "Hydra" were of Nos. 1, 2, and 3, wound on a reel commanded by a brake, and in all the later work of the vessel the descent of the line was retarded. Capt. Shortland was perhaps the first to enunciate the idea "*that a sounding line should not be permitted to run free, but should be resisted by a force equal to the weight in water of a length of the line equal to the depth to be determined.*" Then noting the time intervals the problem seemed easy of solution.

The "Hydra" was a paddle-steamer, and in sounding was kept before the wind, the line running down from the stern,—a method first tried by Capt. Spratt in the Mediterranean. The sinkers weighed from 200 to 400 pounds, according to expected depth. The deepest water found in the Arabian Sea was 2160 fathoms, but a cast made in the South Atlantic gave a specimen from 2830 fathoms. Prof. Sir Wyville Thomson, in his "Depths of the Sea," describes a sounding made from the "Porcupine," Capt. Calver, R.N., in 2435 fathoms, which he considers as "probably the deepest sounding up to that time which was thoroughly reliable," but Brooke's work, long before, in the Pacific, in much deeper water, has been proved to be perfectly reliable, nor is there reason to doubt the results obtained by Ross twenty-nine years previously; and Capt. Shortland, in a note to the writer, says, "If Sir Wyville Thomson had been with us on the 21st August, 1868, when we took our last sounding in the Bay of Biscay,—2600 fathoms, with bottom water, and gray sand and shells brought up,—he would probably have considered it reliable. We all thought it perfectly so, and I inserted it on the Admiralty chart. The 'Porcupine' ought to have had and no doubt did have it on her chart, as well as some copies of the 'Hydra's' sounding voyage on board, and it is strange all this should have escaped the professor's notice."

The writer, when ordered to do similar work in the Pacific, derived much information from the "Hydra's" published report, and an impartial examination of extended deep-sea work up to the advent of the "Challenger" and "Tuscarora" expeditions, will award the palm for accuracy, originality, and inventive grasp to Brooke and Shortland.

The genius of Brooke in devising the apparatus for bringing up specimens of bottom soil, delighting the eyes of the earnest seekers and lending fresh interest to the revelations of the microscope, in the variety and richness of new forms disclosed, but whetted the appetites of the naturalist and geologist, and, like Oliver of the story, they cried for more, or for larger specimens than the quills and cups would bring up; and the dredge, which had hitherto been regarded as only practicable for gathering up the fauna of the shoaler water along the coasts, was improved for the exploration of the wider, nay, illimitable fields of the "abyssal regions" where the darksome organisms, biological milestones under the waters, had lain hidden from the creation. Marine zoology became suddenly invested with fresh and surpassing interest, and, says Prof. Verrill, "Dr. Wallich led off in this new era,—1860,—establishing the fact that the deep sea had its own peculiar fauna at depths far greater than life had previously been supposed to exist, unless in the lowest forms, such as the Rhizopods." Milne-Edwards confirmed these observations—1861—"in finding living mollusca and corals adhering to telegraph-cable in the Mediterranean," which had been hauled up from a depth of 1577 fathoms for repairs. The same year followed the "Swedish expedition to Spitzbergen, and the extensive explorations of Prof. Sars at the Loffoden Islands and on the Scandinavian coast in depths down to 450 fathoms;" but the first more extended and systematic dredging expedition was conducted by Count L. F. de Pourtales, under the instructions of Superintendent Peirce of the U. S. Coast Survey, begun in 1867 and continued until 1869. These explorations were made in the Florida Channel of the Gulf Stream, and extended to depths of 700 fathoms with great success, resulting in the obtainment of "large and remarkable collections embracing numerous representatives of nearly all classes of animals." The first season's work was interrupted by the advent of yellow fever on board, but enough was done "to disclose the interesting fact," says Pourtales, "*that animal life exists at great depths in as great an abundance as in shallow water.*"

This first year's exploration of Pourtales, so short, yet so rich in its yield of new forms, and so important in the grand fact of nature established, undoubtedly "stimulated to a great extent," says Mr. Alexander Agassiz, "the English expeditions of the 'Lightning' and 'Porcupine,' in 1868, 1869, and 1870," which were fitted out by the Admiralty at the solicitation of Dr. W. B. Carpenter, Mr. Gwyn Jeffreys, and Prof. (now Sir) C. Wyville Thomson.

The "Lightning," Commander May, R.N., used for specimens the Fitzgerald machine, an apparatus with detachable sinker, devised for large quantity, but of heavy, unwieldy construction and uncertain in its working. The "Porcupine," Capt. Calver, R.N., was equipped

with sounding apparatus similar to that used by the "Hydra,"—for in dredging the depth must first be found, to do the work intelligently,—and supplied with appliances for trawling and dredging, improved as the experience of the "Lightning" had suggested.

The great achievement of these cruises was the successful dredging in 2435 fathoms in the Bay of Biscay, July 22, 1869; an unparalleled feat up to that time. The machine with which the preliminary sounding was made was the "Hydra," weighted with sinker of 336 pounds, and the line of Italian hemp, with circumference of 0.8 inch. "The line was given off the reel as fast as the weight would take it, so there might not be the slightest check or strain." Capt. Shortland's method of resisting the descent of the line in some measure, was abandoned,—an undoubted mistake. The voyages of these two vessels yielded such happy results that the distinguished explorers, who had in turn taken scientific direction of the work, sought still further favor of the Admiralty, which resulted in the equipment of H. M. S. "Challenger" for a four years' cruise round the world for the further prosecution of those interesting researches in the great domain of the deep; but of this more anon.

The civil war intervening had interrupted these researches by American officers, and four years of strife made them rusty in deep-sea work. The Coast Survey was the first to re-enter the field, and in 1866 we find the steamer "Corwin," Master Platt, sounding in the Florida Channel, under the direction of Mr. Henry Mitchell, Superintendent Coast Survey. Then followed the U. S. S. "Yantic," Commander (now Captain) John Irwin, sounding for cable-line in the waters of the West Indies and Caribbean Sea. About this period, too, the Coast Survey steamer "Hassler," Commander (now Captain) P. C. Johnson, U.S.N , with Prof. Agassiz on board as passenger, sailed for the Pacific, with instructions to make soundings *en route*. The fittings of these vessels seem to have been crude and clumsy, unsatisfactory in their working, and unreliable in their results; in short, not in keeping with the knowledge acquired, experience gained, and position won by the service prior to the war. The inspiring presence of Professor and Mrs. Agassiz could not counterbalance the fatal defect of rotten lines and other sounding appliances, far inferior to those used by the "Hydra" and "Porcupine," which had been furnished the "Hassler"; and candor compels the admission that the work of English officers at this period was much more satisfactory than that attempted by our own service,—albeit, both the navy and Coast Survey are now in advance, in the writer's opinion, in all that pertains to ease and perfection in deep-sea exploration.

So matters stood until Sir William Thomson brought forward the machine destined to revolutionize deep-sea work, and which it was the lot of our service to put to the test almost before its inventor could perfect its working or demonstrate its success under all conditions and in all depths. Sir William proceeded on the principle that "the art of deep-sea sounding is to put such a resistance on the reel as shall secure that at the moment the weight reaches bottom the reel will stop." Here was the solution in a nutshell: Captain Shortland's practice carried to its legitimate and more perfect conclusion; but the time-interval interpretation was rejected,—the reel was to stop, and does stop the moment bottom is struck, or within a second of time.

The apparatus was first tried, 29th June, 1872, in the Bay of Biscay. "I sounded," says Sir William, "from the 'Lalla Rookh' schooner-yacht with a lead weight of 30 pounds (undetachable), hung by nineteen fathoms of cod-line from another lead weight of 4 pounds, attached to one end of a three-mile coil of piano-forte wire, the lengths spliced and wound on a light wheel about a fathom in circumference, made of thin tinned iron plate. The weight was allowed to run directly from the reel into the sea, and a resistance exceeding the weight in water of the length of the wire, actually submerged at each instant, was applied tangentially to the circumference of the wheel by the friction of a cord wound round a groove in the circumference, and kept suitably tightened by a weight." The experiment was so successful that the inventor did not doubt the solution of the problem had been demonstrated; albeit, the crushing and accumulative force of reeling in had disclosed great weakness in the wheel or reel, which would have to be remedied before the machine could be put satisfactorily forward to do the work required, and which caused much trouble and anxiety in hauling back the wire and lead. Bottom had been reached at about 2500 fathoms, and the stopping of the revolutions of the reel was so sudden and marked that the crew thought something had broken, nor did they feel assured to the contrary until the cup came up filled with soft gray ooze. The wire used was piano-forte wire No. 22, Birmingham gauge, weighing about 14½ pounds in air to the nautical mile, and bearing a strain of from 230 to 240 pounds without breaking. "The great merit of wire," says Sir William, "compared with rope, is the smallness of the area and the smoothness of the surface which the wire presents, in contrast with the greatness of the surface and its roughness when rope with a comparable degree of strength is used."

The "Challenger" was fitting out for her famous cruise around the globe at the time this experiment was made, and, not doubting that "the difficulties which had seemed to make the idea of sounding by wire a mere impracticable piece of theory had been altogether got over," Sir William hastened to lay the result before the Admiralty, and suggest the use of the apparatus in the expedition. Its use was declined, however, "until the machine could be perfected," and Capt. (now Sir George) Nares seems to have acquiesced in that decision. Nevertheless the ship was supplied with the original machine and wire, and their working explained by the inventor to the executive-officer, Commander Maclean, R.N. The inventor, too, had, "as one of the committee of the Royal Society, been invited to make suggestions with regard to scientific matters connected with the expedition." Yet the practical suggestion he offered for consideration was neglected, and the vessel proceeded on her unmatched errand, equipped with every instrument and appliance that art and science, mechanical skill, and seaman's experience could devise or suggest, and yet discarded the use of the incomparable machine that could

not only have rendered her work more accurate, but would have lessened the labors of the cruise more than one half, especially if wire rope had been used for dredging, which the beautiful working of the wire in sounding would naturally have suggested. The line used by the "Challenger" was of the best Italian hemp, and the No. 1 size—mostly used—was one inch in circumference, with breaking strain of 14 cwt.

This, coupled with the fact of the use of heavy sinkers,—400 pounds weight in deep casts,—was a great help in the matter of easy and accurate working, but not comparable with the facility and perfectness of action of wire only 0.028 inch in diameter, or considerably smaller in size than the wire used for ladies' hair-pins. The time-interval method was used, and be it remembered, that was the only means the experts of the ship had of interpreting the arrival of the lead on the bottom. The sounding was done from the gangway, the vessel kept head to wind and sea, the line marked at every 25 fathoms was kept on reels on the forecastle, "and," says Navigating Lieutenant Tizard, "the weights are allowed to take it freely as they descend; the reel occasionally moves faster than the weights take the line, and consequently there is a danger of its fouling; to prevent this one end of the reel has a circular disk of wood attached to it like a large sheave, over this a gasket is placed and a man stationed to attend it; should the line unreel faster than the weights take it, he is able to check it at once by tightening the gasket. From the reel the line is led aft through a block to the engine, then up through the block at the mainyard and down to the water," with the "Baillie-Hydra" rod and sinker, as well as water-bottle and thermometer attached for specimen of bottom water and bottom temperature. "The sounding alone," continues Tizard, "at a depth of 2500 fathoms occupies three hours (including heaving in the line), the dredge requires three hours to sink, one hour at the bottom, and three hours to heave in." Compare the three hours occupied by the "Challenger" in making a cast at 2500 fathoms with the average of one hour, twelve minutes of the "Tuscarora's" time in getting answer from that depth, and what a saving of time results!

The "Challenger" put to sea December, 1872, and a few months later, or in April, 1873, the U. S. S. "Tuscarora," under the writer's command, then serving in the South Pacific, was ordered to San Francisco to prepare for the special duty of "making soundings between the western coast of the United States and the east coast of Japan for scientific purposes, and for the purpose of determining the practicability of laying a telegraph-cable between these shores." As has been seen, neither the naval service nor the Coast Survey had recovered the ground lost during the war in deep-sea work, and the appliances in use were not comparable to those supplied the "Challenger." But all this was soon to be changed, and the forefront in adaptive equipment and skilled use of appliances was to be resumed. Commodore (now Rear-Admiral) Daniel Ammen, himself an inventor, with broad and sympathetic views concerning the testing and the introduction of new inventions of practical promise into the service, was chief of Bureau of Navigation, and, regardless of the action of the English Admiralty, and despite the discouragement received in quarters where he had reason to look for more practical views, he ordered one or more of the Thomson machines and a supply of wire as soon as he heard of the promising experiment in the Bay of Biscay. The machine was still in an imperfect state, but the chief of bureau gave no heed to that; he knew that while genius conceives, creates, the less brilliant mind can improve and modify, and that the spirit of our service is second to none in its welcome to new ideas, and in its earnest, persistent effort to improve upon them.

The modest little Thomson machine in its snug iron tub and 180-pound package of wire seemed absurd in contrast with the heavy iron reel and dynamometer, donkey-engine, and the forty-odd miles of rope, of varying sizes, supplied the "Tuscarora"; but, like David and Goliath of sacred story, the little drum, which with four miles of wire weighed hardly 130 pounds, was, as steadily improved, to be the easy victor.

The machine simply consisted of a hollow drum of thin galvanized iron, a fathom in circumference and three inches wide, revolving on an iron shaft. The disks forming the sides were enough larger than the drum to form rims, like the rim of a car-wheel, two or more inches deep, and a third rim projected from one side forming a V-groove; on one side of the shaft a ratchet-wheel was fitted to receive a pawl, and the other had a wormed brass wheel by which its motion was communicated to the cog-wheels of a counter, having three dials to register the revolutions. The shaft, fitted at each end for cranks, revolved on metal standards bolted to a stout oak plank 3½ feet in length and 15 inches in width. The weight of the drum, including the shaft, was hardly more than 60 pounds. The dynamometer-wheel revolving in an iron crotch, was placed in rear of and close to the drum, and in a line with the V-groove; it had one groove in its rim wide enough to take two parts of rope, and another much narrower, to receive a cord. The dynamometer was simply a spring balance with scale and index hand, fastened to the bed of the machine, and connected with the dynamometer-wheel by a cord which lay in the narrow groove of its rim, and passing down through a hole in the wheel, was made fast to the rod attached to the springs of the dynamometer. Now any strain brought to bear on the dynamometer-wheel to make it turn would be indicated on the scale by the pointer.

When making the machine ready for use, an endless rope of the proper size—soft albacore line was used on board the "Tuscarora"—is placed in the V-groove of the drum, and the lower part or bight is placed over a grooved iron pulley-wheel and kept taut by means of a pendant run through a stationary block, the lower part of the pendant having a number of hooks from which to suspend weights of different sizes as required. The machine, as received, was fitted with a tackle to tauten the endless rope; the pendants and weights were substituted after the first trial of the apparatus at sea. It will be understood that the endless rope runs freely round the V-groove as the drum turns, but being kept taut, the friction of the line restrains the action of the drum, and passing round the dynamometer-wheel communicates the amount of tension on the wire to the dynamometer, which

is at once shown on the scale by the movements of the pointer. *Now bearing in mind that, when sounding, the resistance applied frictionally is always to be in excess—say by ten pounds—of the weight of the wire in water, of the amount out at every moment of the sounding, it follows that when bottom is struck the reel or drum will stop, for, released from the weight of the sinker, the descent of the wire is now restrained by a force greater than the weight of the wire out, and must stop and does stop almost instantly.* As the weight of the wire in water is hardly more than 12 pounds to the 1000 fathoms, it is a very simple matter to know what resistance to apply from time to time, by watching the counter which registers every turn of the drum. On board the "Tuscarora," working in deep water, it was the practice to restrain the wire considerably at the beginning of a cast, then to take off most of the weights applied to the dynamometer, and let the wire run freely. As bottom was thought to be neared, the proper weights were restored, always with the happiest results.

The inventor's idea had been to haul back a 30-pound lead with valve-cup for specimen; but this imposed extra labor, besides bringing unnecessary strain on the drum—already too weak—as well as on the wire; and, in fact, was not in keeping with the other features of his apparatus nor the ideas of deep-sea work at this stage. Sir William himself subsequently adopted the use of detachable leads. A lot of Brooke rods supplied the ship were fitted with a modification of the Sands cup, but their stems were so slight they often broke off in use, and the specimen brought up was small. The rod itself when properly constructed seemed to be the best detacher yet devised: simple, easily made, and as sure in its working, when properly handled, as anything made by man can be. There was no need to go outside our own service for any other device; the only thing needed was an improvement looking towards the bringing up of a larger specimen, and to go with a heavier sinker than the 32-pounder shot.

After much experiment both at sea and in port, three different cups or cylinders, 2¼ inches in diameter, were devised to go with 8-inch shot bored through to receive them, which subserved the purpose satisfactorily; the No. 2, as was expected, proving to be the best for general use. The weight of the bored shot was 55 pounds, but in depths beyond 3000 fathoms a heavier sinker was found advisable, and a lead casting of 15 or 20 pounds' weight was added when working in the deeper water. New rods were made and forged as lightly as possible consistent with strength, so that the weight to haul back would be no greater than absolutely necessary, the advantage of which precaution was readily seen when working in depths of 4000 fathoms and upwards.

When the fittings of the ship were completed a short run was made outside the Heads of San Francisco to test the apparatus and appliances, and familiarize the officers and men with their working. This experimental trip at once demonstrated the superiority of wire over rope for the purpose in hand; but the drum proved to be too weak for the strain imposed upon it, and other defects were disclosed, which had to be remedied before the ship could proceed with confidence on her mission. Meanwhile, Sir William himself was experimenting with the machine, endeavoring to correct faults of construction and improve its working, so that it would stand the demands likely to be made upon it. His idea was to retain the original lightness of the drum and keep down its inertia, and he devised an auxiliary pulley fixed to the bed of the machine, with a castor-pulley to receive the wire from outboard in coming in. Cranks were fitted to pulley and drum, so that either two or four men could work them, and the wire was so led over the castor-pulley and round the auxiliary pulley that the drum was relieved from two-thirds to nine-tenths of the strain originally imposed upon it. He also did away with the dynamometer and its wheel, which had been fitted to the machine furnished the "Tuscarora," and went back to the simple friction-brake, such as he had used in the Bay of Biscay, but now controlled by weights, which could be put off and on at pleasure as the depth required.

The method pursued on board the "Tuscarora" was in the direction of preserving the features of the simple reel and dynamometer. The experimental cruise and all subsequent experience demonstrated the fact that the weight could be increased to 250 pounds, if necessary, without affecting the sensitiveness of its indications, and there was no time to dream and ponder over radical changes; the work was laid out and seasons would not wait; it was expected that the survey would proceed with the means already in hand, and every effort was bent towards strengthening the drum in its original simplicity. The drum which had been badly crushed in the experimental cruise was restored in outline and strengthened, and a new one made of heavier iron, with wider face to give more room for the wire. The new reel would easily carry six miles of wire; the V-groove was deepened, and the wide groove in dynamometer-wheel widened to lessen the probability of the endless rope flying out in rapid working. The heavy iron reel and dynamometer which had been placed on the topgallant forecastle for sounding with rope, was also improved as experience had suggested, and other modifications in the appliances which the trial at sea had seemed to make imperative.

The ship now put to sea to begin the work assigned,—of running a line of soundings from Cape Flattery to Yokohama, Japan, *via* the Aleutian Islands; and after a reconnoissance in the waters of Puget Sound for a suitable place to land a cable, departure was taken from Cape Flattery, September 17, 1873.

Lieut.-Commander T. F. Jewell was assigned charge of the heavy reel forward and an extra wire apparatus for taking serial temperatures; Lieut. G. A. Norris was given the management of the Thomson machine, operated in the gangway; selected petty officers acted as assistants, so that the machines were always attended by the same persons, who gaining experience all the while came to know how to meet every phase of difficulty attendant upon the ever-varying conditions at sea; for simple as is the working of the wire machine, "personal equation" should not be overlooked, as great care and attention to details is necessary, and the apparatus needs to be managed as deftly and

carefully as a sextant or chronometer to make sure of good results.

Intending to sound alternately with the rope and the wire, the use of the former was abandoned after the twelfth cast; it occupied so much more time than wire, though the albacore line used was about the size of the "Challenger's" rope No. 1. It had not near the strength of that carefully-prepared line, however, and was apt to break after two or three casts.

The weather was such that steam had to be used most of the time, and after a run of 1100 miles the ship put back to Puget's Sound for coal. Twenty-five casts had been made with the wire in deep water with marvelous ease, and with the original drum, though now it began to show signs of distress. The last and deepest cast was in 2534 fathoms, and after passing a ridge some 200 miles west of Cape Flattery, the average descent had been a fathom to a mile. The time occupied in the deepest cast was one hour, forty-four minutes. This was good for a beginning, but the "Tuscarora" came to regard a cast of 2500 fathoms as an ordinary matter whatever the state of weather and sea, and with a further saving of half an hour in time.

The season was now so far advanced that the Department ordered the ship to return to San Francisco, sounding *en route* "off and on" to ascertain the true continental outline, a work Prof. Agassiz had long had at heart. Eighty-three soundings were made, and some of the lines extended seaward 200 miles. More abrupt in its descent than the shores of the American North Atlantic, a run off the coast of 70 miles would sometimes show a fall of 2¼ miles.

Complications with Spain threatening war, the ship's battery, which had been taken out of her to make room for extra coal and heavy sounding-gear, was restored, and the heavy reel and great stores of rope were landed. The whole wire apparatus took up little more space than a division-tub, and the ship was now ready to take part either in the stern demands of war, or to continue her beneficent mission of peace. Meanwhile the appliances were improved, and two new drums were made of heavy sheet-iron,—one of them, filled in with wood to help resist the crushing pressure in reeling in; and about the middle of December, the clouds of war having blown over, the ship was ordered to proceed to San Diego, continuing the soundings for "continental outline," and to take departure from that port in running a line across the central North Pacific *via* the Hawaiian and Bonin groups. Fifty-eight casts were made *en route*, the deepest in 2165 fathoms, and the original drum did all the work. The same outline was developed, and a retreat of the waters would show a continent buttressed and bastioned like an immense fortress.

Having filled bunkers and deck with coal, the ship left San Diego, January 6, 1874, and twenty-seven days after anchored in the harbor of Honolulu. Sixty casts had been made, the deepest in 3054 fathoms; the apparatus had worked beautifully, no accident had occurred to dampen the ardor of the surveyors, and the machine, as sensitively perfect at three miles as in lesser depths, showed, whether sounding by night or by day, results equally accurate and indisputable. The action of the dynamometer, the stopping of the drum, the detachment of the sinker and the bringing up of bottom soil, all gave undoubted proofs of accuracy. The original drum supplied, as willing as the little donkey-engine on board the "Porcupine," whose pantings excited the pitying comments of Sir Wyville Thomson in his "Depths of the Sea," had still done much of the work on this line, but was now remanded to the forecastle for the taking of serial temperatures.

During the passage a temporary apparatus was contrived to relieve the crew somewhat in the labor of reeling in the wire, which had hitherto been done, hand over hand, by means of the endless rope; and at Honolulu an iron fly-wheel 400 pounds in weight was cast, to which was fastened a grooved wooden disk to take one bight of the endless rope. The wheel was mounted on standards, placed on a flying-bridge thrown across the ship from gangway to gangway, and cranks were fitted on each end of the shaft, with room for four men to work them. This economized both time and labor, and with the large crew of a man-of-war the writer would prefer it to an engine for the purpose in question. A new reel was also constructed of light boiler-iron, and since experience has shown that the weight of the drum might be materially increased without detriment to accuracy, it was suggested to the Bureau of Navigation that a steel drum might be cast strong enough to withstand any strain likely to be imposed upon it. Such reels are now in use in the service, and Commander W. S. Schley, U.S.N., was the first to thoroughly test one of them in sounding across the South Atlantic in the "Essex," from St. Paul de Loando to Cape Frio. The soundings were about 100 miles apart, several in depths of over 300 fathoms, and the reels stood the test admirably.

The soundings from the "Tuscarora" were made from the gangway,—the ship brought stern to wind and sea, all sails furled except jib, the yards laid as circumstances of wind and sea required, and the vessel, under easy steam, kept in position by working the engines as necessary. Sometimes the heavy sea in the strong trade region would board the vessel over the poop, and soundings were made at times when a well-found ship would stagger under treble-reefed topsails. So continued the work week after week, sounding at night as well as by day, and in all sorts of weather; yet one never tired watching the working of the reel, so noiseless and perfect in its action, and the wire so fine that it could hardly be seen from the poop-deck in cloudy weather or when passing clouds threw shadows over the ship. Sometimes at the approach of evening the writer stood in the cabin doorway watching, in the deepening twilight, the movements of the drum, and could detect instantly the moment of striking bottom, although the revolutions could only be distinguished by certain discolorations on the sides of the drum as they met the eye in passing round. At night, too, the gleams of the lantern flashing on the drum—only needed for the reading of the counter and the noting of the splices — recording the amount of wire out, revealed its motions and indications at the far ends of the ship equally well. One of the supposed drawbacks in the use of wire was in the making of safe splices, but the difficulty was purely imaginary; made with long

jawed twist, two feet in length, the ends and one or two points in the middle lightly soldered, and the whole served with waxed twine, no splice ever failed, nor did any break ever occur at a splice. When a sounding was completed, the machine was unrigged—the work of but a few minutes—and the reel put in a tub containing a solution of caustic soda to preserve the wire from rust. The writer has in possession several pieces of the wire taken from the reels, which, after all the work in sea weather and six years' exposure to the air, show hardly any signs of rust. The under-currents sometimes played strange freaks with what was called the stray-line,—a line of soft rope 25 fathoms in length, placed between the sinker and the end of the wire to prevent the wire from touching bottom; for, relieved from strain, the end of the wire would be apt to fly upward, kink, and break. To prevent the possibility of this, a small lead of 4 pounds weight was made fast to the bend joining wire and stray-line, so that when the sinker struck bottom the wire would still be kept at a tension by this smaller weight. On one occasion when the currents made havoc with calculation, the sinker had to be hauled back from 1900 fathoms; the slings had been freed from the trigger, but the stray-line had taken half a dozen turns round slings and rod and hitched itself, the slings thus lashed to the rod there was no possibility of getting rid of the sinker. To overcome such difficulty a rod of heavy wire a fathom in length was fitted with an eye in each end to go between detacher and stray-line; the idea being that the rod in falling would carry the line clear of the sinker, which device worked to a charm. The first 600 miles from San Diego taking the depth of 1900 fathoms at the beginning of the ocean-bed proper, the depth increases in varying curves 494 fathoms; then a distance of 1050 miles the water deepens only 286 fathoms; the next 500 miles shows a gradual descent to a depth of 3054 fathoms, when, after an intervening ridge 3500 feet in height, the bed suddenly rises to a depth of 937 fathoms 18 miles from the Hawaiian group.

The run to the Bonin group from Honolulu occupied twenty-nine days, and the results were of a most interesting character. The story told by the lead shows that were the waters of the Pacific drained, six mountains, varying from 7000 feet to 12,600 feet in height, would stand revealed between the two groups in bold and rugged outline, clothed on their sides and tops with coral limestone, sand, and lava, and solid rock, with yellowish-brown soil in their valleys. Fifty-nine casts had been made, 18 of them in over 3000 fathoms. The deepest water found was 3267 fathoms, and near the Bonins. Twelve casts were made between the Bonins and Japan, the deepest in 2435 fathoms; and Yokohama was reached on the 22d of April, 1874,—a welcome haven of rest after much hard work and anxiety,—and it was a great satisfaction to cable the Department, *via* China and India, that the mid North Pacific line had been completed.

The "Challenger" was now and then heard from, and it seemed strange she did not use the wire for sounding as well as wire rope for dredging. So complete had been the demonstration in favor of wire in the soundings towards the Aleutians, September, 1873, that had the scope of the "Tuscarora" expedition justified dredging, steel-wire rope would at once have been asked for. Such rope is now used in the Coast Survey, and was first introduced on board the "Blake" in 1878, at the urgent instance of Mr. Alexander Agassiz, who, as a mining engineer, had seen the advantages of wire rope so early as 1868, which fact he broached to Pourtales on his return in the "Bibb" from his second expedition to the Florida Channel that year. Mr. Agassiz had also in the winter of 1869 asked the attention of Prof. Wyville Thomson to the advantages possessed by wire rope over the heavy hempen lines, but the "British navy men" interposed the objections of want of pliability, the liability to kink and break, and so on, as they did later in the case of wire for sounding, forgetting that careful management, more than repaid by the results obtained, readily overcomes all such imaginary difficulties. Mr. Agassiz himself first tried the wire rope on a small scale dredging from a boat off Nahant in 1871.

The wire rope first supplied the "Blake" was of galvanized steel, 1¼ inches in circumference, with hemp core; its breaking strain, 8600 pounds. Economy of space was gained as well as a great saving of time and labor, enabling several hauls of the dredge to be made in a day, "while in the 'Challenger,'" says Mr. Agassiz, "the best part of the day was generally consumed in making a haul at a depth of 1500 fathoms."

While resting the crew and waiting the advent of summer at Yokohama before proceeding to finish the northern line of soundings, new drums of still heavier boiler-iron were made, strengthened by every device that experience and skill could suggest; for practical as were the results of the expedition, the work of the cruise was experimental from beginning to end, and at no time during the survey was the need of best appliances more necessary than on the homeward route *via* the Aleutians.

Yokohama Bay was left on the 9th of June, and two days later, and at a distance of only 100 miles from the coast, the depth indicated was 3427 fathoms, the water having deepened 1833 fathoms in a run of 30 miles. The next cast was still more startling, when at 4643 fathoms the wire broke without bottom having been reached; it was in the Kuro Siwo or black stream of Japan, and the current so strong that the wire, in spite of all that previous experience in management could suggest, was swept under the ship, finally parting under the strain. The purposes of the survey and amount of wire on hand would not admit of continued experiment, nor was it believed a cable could be laid in such deep water encountering so strong a current. Therefore the ship was headed in shore to run up the coast and begin a new line. The great circle towards Tanaga, of the Aleutian chain, was taken up again in lat. 40° N., but here the water deepened markedly, and at the third cast from the initial curve of departure the lead sunk to 3493 fathoms, followed up by depths of 3587 fathoms and 3057 fathoms 40 and 80 miles farther on. Then, in the next 40 miles, the bed was found to drop to the extraordinary depth of 4340 fathoms, and the Miller-Casella thermometer for bottom temperature came up a perfect wreck! The next six casts were in 4356, 4234, 4120, 4411, and 4655

fathoms respectively. Good specimens had been brought up from four of these depths, and in one other the cup had struck solid rock. At the last two and deepest casts the wire had parted; in the first instance the accident was due to carelessness in reeling in, but in the last and deepest cast the wire fairly pulled in two, being part of a new batch not so strong as the wire originally furnished. In view of these losses and the remarkable depth developed, it was determined to run back to Hakodadi for a fresh supply of coal; then to skirt the Kuriles for some distance before heading over for the Aleutians. These deep casts had been made under exceptionally favorable conditions,—light wind, smooth sea, and gentle swell. No plummet could have dropped straighter into well than the wire ran down in these four- and five-mile depths; and the indications of the dynamometer were as wondrously perfect as ever. There could, indeed, be no mistaking the moment of touch, and the demonstration seemed clear and indisputable that any system of showing when bottom is struck, based on intervals of descent, must be crude and unsatisfactory as compared with the perfect and unmistakable indications given by the Thomson apparatus and wire. These are the deepest soundings yet made, and the one in 4120 fathoms occupied but $1^h\ 47^m\ 42^s$ from beginning to end.

The "Challenger" subsequently made one cast in 4475 fathoms between the Caroline and Ladrone Islands, bringing up a bottom specimen, the only depth in over 4000 fathoms she sounded during her voyage of four years. "Of this cast," says Lieut. Campbell, R.N., "we had to sound twice to make sure, as the weights were not sufficient in this case." Concerning these deep soundings, Dr. Wild, of the scientific staff of the "Challenger" expedition, says, in his "Thalassa," "that the greatest of all depths of which we have reliable evidence was found by the 'Challenger' on the 23d of March, 1875, in lat. 11° 24′ N., lon. 143° 16′ E., and amounted to 4475 fathoms, or about five miles and a quarter. Several soundings exceeding 4000 fathoms were obtained by the 'Tuscarora' to the eastward of Niphon and Yesso, and another close to the most westerly of the Aleutians. Two of these soundings are over 4600 fathoms, but as it appears that no sample of the bottom was brought up, there is no evidence of the bottom having been reached." Lieut. Campbell and Mr. Spry both give the same opinion in their entertaining volumes descriptive of the "Challenger's" cruise; and now Dr. Carpenter comes forward with an article on the "Deep Sea and its Contents," in the *Nineteenth Century* magazine, in which he says, "the deepest *trustworthy* sounding yet made was in 4475 fathoms, from the 'Challenger.'" What are the facts, remembering that not one of these gentlemen has ever seen the Thomson machine operated? Plainly that, using the time-interval method at great depths, the soundings can never be regarded as satisfactory unless a sample of bottom is brought up; but that working with wire and the Thomson apparatus, there can be no more mistaking when bottom is reached, the reel suddenly stopping, pulled back by an irresistible force the instant the sinker strikes bottom, than the emphatic fact shown by the sudden bringing up of a ship in harbor when the anchor is let go. The chain might snap, but there would be no doubt the anchor struck bottom. In short, here was a machine, the invention of a distinguished British scientist, which the conservatism of British officers rejected without trial, being operated with the happiest results on board an American cruiser, yet having the indisputably good work achieved, questioned, and denied by the same spirit of prejudice and conservatism which was content to rest under the delusion that no advance could be made over the time-interval method, using rope and letting it run freely from the reel. "But," said Sir Wyville Thomson, director of the Civilian Scientific Staff, and the master-spirit of the "Challenger" expedition, in an address before the Asiatic Society of Japan, June, 1875, "since we started Capt. Belknap has sent me an extraordinary series of soundings, which none of us have the slightest doubt of being absolutely correct, which give depths with which we were previously unacquainted." And in a note to the writer he further says, "Of course now none of us would dream of anything but wire for either sounding or dredging." To these opinions may be added the fact that the Geographical Society of Berlin has officially accepted the "Tuscarora's" work as being "the deepest sea measurement on record." Were the lists to be entered, indeed, as to the question of accuracy as between the soundings of the "Challenger" and the "Tuscarora," there would be little doubt in the minds of those who had seen the working of both rope and wire in deep water as to their verdict.

Hakodadi was left on the 30th of June, and skirting the Kuriles until latitude 48° N. was reached, the course was laid across to Aggatou, of the Aleutian group. Deepening rapidly again, a depth of 3754 fathoms was found about 110 miles east of Cape Lopatka, whence the bed rises and forms a ridge between that point and the Aleutians, like the "Dolphin Rise" in the Atlantic, the trough next the latter group having a depth of 4037 fathoms. Arrived at Tanaga Island, a survey was made of Glory of Russia Bay, then the line was continued on through Behring's Sea to Oonalaska, where mails and coal were awaiting the ship. After a stay of nine days the ship put to sea again, and on the 21st of August the survey was completed, and all sail crowded for San Francisco.

Another deep trough was developed by the soundings to the eastward of Ooneemak Pass, in the Gulf of Alaska, running parallel with the Aleutians, in which the greatest depth found was in 3664 fathoms, and which presumably continues along the whole Pacific side of the chain.

When the experience of the "Tuscarora" had established beyond cavil or doubt the feasibility of using wire for soundings, the Coast Survey took it up, and Lieut.-Commander C. D. Sigsbee, U.S.N., commanding the "Blake," set about to master its details in earnest. Sigsbee was fortunate in having ample time for his experiments, and the earnest co-operation and support of the superintendent of the Coast Survey, Mr. Carlisle P. Patterson. Sigsbee invented a bottle for bringing up specimens of water from the bottom, the construction of which would do credit to the genius of an Edison, and, besides remodeling and improving the appliances for dredging, rendering those used by the "Chal-

lenger" practically obsolete, he made a sounding-machine on the principle of the Thomson apparatus, but differing from the constructive ideas of Sir William and the methods of the "Tuscarora." His machine is now exclusively used in the Coast Survey; but, whatever the advantages claimed for it over the original machine as improved, it is considerably more expensive and cumbersome than the simple steel reel supplied our ships of war by the Bureau of Navigation,—inexpensive, portable, taking but little room for stowage, readily put together, easily manipulated, and as perfect in its working at 4600 fathoms as at 100 fathoms. The simpler the machines and instruments, and the fewer the parts of their mechanism for use on shipboard, the better. The idea of Sigsbee was to eliminate "personal equation" in the use of the apparatus,—*i.e.*, to make a machine that would work without fail, however carelessly handled,—a thing exceedingly difficult to do, as the factors of "personal equation" unconsciously enter into every incident and effort of human life and affairs, controlling the methods of success as well as dominating the causes of defeat. Sigsbee claims in brief the following-named advantages for his latest improved machine, viz.:

"1st. To have the effect of a *dynamometer* to make known the strain on the wire at all times in reeling-in.

"2d. To have the effect of a governor on the action of the reel when the vessel is rolling or pitching.

"3d. To get an automatically increased resistance on the reel—to stop it—at the instant of getting bottom. (The original reel does this in accordance with the main intent of the machine.)

"4th. To get a record of the amount of wire paid out, so as not to require interpolation.

"5th. To apply resistance to the reel, without using the inventor's unhandy lead or iron weights.

"6th. To get generally a machine which is easier of manipulation than the original Thomson machine."

The Sigsbee machine works admirably, and for vessels constantly engaged in hydrographic work it is perhaps better adapted for their use as permanent fittings than the more simple reel used by the cruisers; which reel, simple as it is, speaks for itself in the work of the "Tuscarora," "Narragansett," "Gettysburg," "Essex," "Wachusett," "Alaska," and "Saratoga," in the most extended deep soundings on record.

Sigsbee himself made from the "Blake" 958 soundings with wire in the Gulf of Mexico and Florida Channel; 203 were in 1500 fathoms and upwards, and the deepest in 2119 fathoms. Commander John R. Bartlett, U.S.N., commanding that vessel, made in the winter of 1878–79 in the Caribbean Sea and passages 664 wire soundings,—the deepest in 3138 fathoms, but a great proportion of them in less than 1500 fathoms.

In running the two lines across the Pacific and in making the soundings for "continental outline," all of which was done before the "Challenger" entered the North Pacific, the "Tuscarora" had traversed 16,600 miles of ocean and made 483 casts, while the "Challenger's" soundings during her four years' voyage numbered but 384. One hundred and sixty of the "Tuscarora's" casts were in depths of 2000 fathoms and upwards, 32 in more than 3000 fathoms, and 9 in depths of from 4000 to 4655 fathoms. Shortly after arrival at San Francisco (September, 1874), the writer relinquished command of the vessel to Commander (now Capt.) Henry Erben, U.S.N., who in November of that year sounded from San Francisco to Honolulu, making 62 casts, the deepest in 3252 fathoms. Pretty much the same contour was developed as had been found on the San Diego line, but Erben discovered a submarine mountain about one-third the way across from the coast of California, 11,000 feet in height, its peak of solid rock. Subsequently, Commander J. N. Miller took the ship, and ran a line from Honolulu to Brisbane, Australia, *via* the Phœnix group and the Fejees. He made 107 casts, 18 in upwards of 3000 fathoms, and the deepest in 3448 fathoms. Until recently Commander John W. Philip, U.S.N., has been doing deep-sea work in the vessel off the west coast of Mexico and Central America. So far as heard from his deepest cast was in 2921 fathoms, near Acapulco. Commander Geo. Dewey in the "Narragansett" used the apparatus in his survey of the Gulf of California,—the first officer to sound with wire after the return of the "Tuscarora" from Japan, making a cast in 2000 fathoms in fifty-five minutes to start off with,—and Capt. Geo. Brown in the "Alaska" found no difficulty as a regular cruiser in stopping to sound at the same depth *en route* to the Pacific.

Lieut.-Commander F. M. Green had an interesting experience in the "Gettysburg"—1876—in running a line from the vicinity of Porto Rico, and passing over some of the "Challenger's" work. That vessel had made a cast in 3875 fathoms, the deepest yet found in the Atlantic, some 80 miles north of St. Thomas, and Green got bottom in 3595 fathoms, 11 miles south of the "Challenger's" position, and 3697 fathoms 130 miles north of it. Lieut.-Commander H. H. Gorringe then took the ship, and sounded from the Azores to Gibraltar, discovering an extensive bank of pink and white coral 130 miles to the westward of Cape St. Vincent, the water suddenly shoaling from 2781 fathoms. One of the most important of the lines sounded across the ocean was run by Commander W. S. Schley in the U. S. S. "Essex,"—1877–78,—from St. Paul de Loando, Africa, to Cape Frio, Brazil, *via* St. Helena, in which he made 39 casts, the deepest in 3284 fathoms, the deepest water yet found in the North Atlantic. No accident marred the result of his work; it was admirably done in every respect, and assured the value of the improved steel reel beyond question. The "Saratoga" training-ship (old sailing-sloop), Commander R. D. Evans, U.S.N., has made some soundings with wire, but at what depths the writer is not informed. The latest extensive deep-sea work done by our service was that of the U. S. S. "Wachusett," Commander Byron Wilson, *en route* to the Brazils, October and November, 1879, in that portion of the Atlantic embraced between lat. 42° 19′ N., lon. 42° 34′ W., and lat. 28° 40′ N., lon. 42° 34′ W. Commander Wilson made 41 soundings in all, the deepest in 3284 fathoms. In short, many of our cruisers, besides the vessels detailed for special service, are now furnished with the Thomson apparatus, and have but to seek the depth to

find it; and in time, with international co-operation, the features of the ocean-bed may be almost as accurately delineated as the physical aspects of the dry land; but here "personal equation" steps in, and only those commanding officers interested in the spell of the depths will ever attempt to break the seal for fresh glimpses at the secrets hidden beneath the waters, except under the stress of the most positive orders.

The "Tuscarora" and, presumably, the other ships generally, got the bottom and intermediate or serial temperatures, besides specimens of the bottom soil. Unfortunately, no adequate provision was made for the examination of specimens, which involves much time, labor, and expense, and but little progress has been made in giving results to the world, leaving the "Challenger" a clear field in the promulgation of her discoveries.

Automatic machines have been devised from time to time for finding the depth independently of line, but none of them could be depended upon sufficiently to warrant their adoption. The latest of these, perhaps, is an apparatus recently presented by Sr. Henrique de Lima e Cunha to the Lisbon Academy of Sciences, the principle of which is based on the effects of atmospheric pressure. "It consists of a cone of sheet-copper, having for its base a diaphragm of the same metal, and which screws into the bottom of the cone so that it may be readily removed when necessary. In this movable base there are six small holes, one millimetre in diameter, which allow the ingress of the sea to the interior of the cone; and to the centre of its upper surface there is soldered a vertical wire of pure silver two millimetres in diameter, and which occupies the axis of the cone.

"To prepare the apparatus for use the silver wire is moistened with nitric acid, which results in the production of a thin film of nitrate of silver. The base being screwed on, the cone is suspended by means of a ring at its apex, and sunk by means of two separate weights or stones suspended by cords or chains depending from three rings attached to the perimeter of the cone. To insure a vertical position to the apparatus, and to prevent it from being easily turned from its course, a small float is attached just above the suspension-ring at the apex of the cone. As the apparatus sinks into the sea, the water penetrates into it through the orifices of the diaphragm, and gradually rises in proportion as the pressure increases during the descent; the salt water acts on the thin coating of nitrate of silver on the wire, and turns it perfectly white by the production of chloride of silver as far as immersion has taken place. By this means, therefore, is determined to what height the water has risen in the cone, and consequently what the pressure has been; and from these data the depth to which the instrument has descended is easily determined by simple formulæ. The author suggests that by suspending the lower weight by means of an apparatus which would detach it on striking bottom, the apparatus would ascend to the surface of itself, thus dispensing with the use of a line."

It is to be feared this machine makes better showing on paper than it would in actual practice. Taking into account the inevitable drift of ship, the easy hiding of small objects at sea, and the vagaries of submarine currents, where would one look for the apparatus after its return from a voyage to the depths in 3000 fathoms? Let the wind-tossed balloon answer, for the under-currents would act as potently in the one case as the wind in the other!

When two-thirds of the "Challenger's" voyage had been completed, Capt. Sir Geo. S. Nares, R.N., was directed to return home and assume command of the Arctic expedition which the Admiralty dispatched towards the pole in 1875, and Capt. Frank. T. Thomson, R.N., took command of the "Challenger"; and while the world accords every tribute of admiration and appreciation to Sir Wyville Thomson and his able corps of civilian coadjutors, let it not be forgotten that the labor, care, skill, and responsibility of the *actual* deep-sea work of the expedition devolved upon those able captains, seconded by the untiring efforts of the officers of the ship. "At each of the observing stations of the 'Challenger,'" as succinctly stated by Dr. Carpenter in a paper on "The Deep Sea and its Contents" in a recent number of *Nineteenth Century*, "a sounding was taken for the determination of the exact *depth;* the *bottom temperature* was accurately ascertained; a sample of *bottom water* was obtained for chemical and physical examination; and a sample of the bottom itself was brought up. . . . At most of the stations *serial temperatures* also were taken, so as to enable 'sections' to be constructed, giving what may be called the *thermal stratification* of the entire mass of ocean-water along the different lines traversed, and samples of sea-water were also obtained from different depths. At most of the stations a fair sample of the bottom fauna was procured by means of dredge or trawl, while the swimming animals of the surface and of intermediate depths were captured by the use of a 'tow-net,' adjusted to sweep through the waters in any desired plane. And while the direction and route of any surface-current were everywhere determined by methods which the skillful navigator can now use with great precision, attempts were made to determine the direction and rate of movement of the water at different depths, wherever there was any special reason for doing so." In addition to all this—the special work of the expedition—the usual meteorological and magnetic observations noted and recorded on board every well-ordered ship of war were made.

Extensive as were the "Challenger's" explorations, much unexplored ocean remains to be examined, for while she crossed the North Atlantic twice, between the parallels of 20° and 40° N., and traversed its length between those parallels three times, and ran a line from the Canaries to the Cape de Verdes, thence southwardly to and along the meridian passing close to Sierra Leone, Ascension, and Tristan da Cunha, and crossed the South Atlantic from a point near Sierra Leone to Pernambuco, and from the Cape of Good Hope to Monte Video, she left the heart of the great Indian Ocean untouched, and crossed the Pacific only once and a half, traversing its length in the central and western portions twice between the parallels of 40° north and 40° south latitude respectively.

The lines run by the "Tuscarora" under the successive command of Belknap, Erben, and

Miller, crossed the Pacific three times, and Schley's line, in the "Essex," ran through the heart of the South Atlantic; but much yet remains to be done, and as the great mass of deep-sea exploration has been conducted by Great Britain and the United States, what more appropriate than that our government should dispatch an expedition to match that of the "Challenger," and, entering "fresh fields and pastures new," gather up more threads of the warp and weft of nature for the weaving of the geologist, the naturalist, and the hydrographer?—*Geo. E. Belknap, Captain U.S.N.*

Deep-waisted. A vessel is *deep-waisted* when the poop and forecastle are much elevated above the general level.

De facto (*Lat.*). Literally, from the fact. Used generally to signify what actually is, in opposition to that which has the right to be. See DE JURE.

Degree. The 360th part of the circumference of a circle,—the unit of measure for angles and arcs. See LATITUDE and LONGITUDE.

De jure (*Lat.*). Literally, from the law, by right. Used generally in contradistinction to *de facto* (which see).

Dekoyts. See DACOITS.

Del a bit. Not a bit; a phrase which has been corrupted to "devil a bit."

Del Credere. A percentage on a cargo under particular circumstances of trust. Also, the commission under which brokers sometimes guarantee to the insured the solvency of the underwriters.

Delfyn. The old manner of spelling *dolphin.*

Delivered. When the harpoon has been imbedded in the body of a whale so that the barbs hold fast it is said to be delivered.

Deliverer. An artificer employed in early ships of war in constructing the castles.

Delivery, Outboard. A hole through a vessel's side, at or about the load water-line, protected by a valve, through which the refrigerating water, uncondensed vapor, etc., are ejected from the condenser by means of the circulating-pump and air-pump.

Delivery-valve, Discharge-valve. The valve of a pump through which a fluid is forced by action of the plunger or piston, and which by its action, automatic or otherwise, prevents a return of the fluid.

A valve for regulating or permitting the escape of a fluid from a reservoir.

Delphinus. *α Delphini*, Svalocin. See CONSTELLATION.

Delta. A name given by the Greeks to the alluvial tract inclosed between the bifurcating branches of the Nile and the sea-coast. Rivers which deposit great quantities of matter very often separate into two or more branches previous to their discharge into the sea, thus forming triangular spaces, aptly termed *deltas*, from their resemblance to the Greek letter Δ.

All deltas appear by their section to be formed of matter totally different from that of the adjacent country. They are the creation of the rivers themselves, which, having brought down with their floods vast quantities of mud and sand from the upper lands, deposit them at the margin of the sea where the current ceases.

Demi-cannon. An ancient name for a gun carrying a ball of 33 pounds weight, with a length of from 12 to 14 feet, and a diameter of bore of 6½ inches; its point-blank range was estimated at 162 paces, and its random one at 2000.

Demi-culverin. An ancient cannon which threw a ball of 9 pounds weight, was about 9 feet long, and 4 inches in diameter of bore; its point-blank range was called 174 paces, and its random one about 1800.

Demihag. A long pistol, much used in the 16th century.

Demonstration-ships. Ships kept in a certain state of preparation for war, though on a peace establishment.

Demurrage. A term applied to the detention of a vessel beyond the stipulated or usual time for loading, delivering cargo, or sailing. The compensation due to a ship-owner from a freighter for unduly delaying the vessel in port beyond the time specified in the charter-party or bill of lading. A ship unjustly detained, as a prize, is entitled to demurrage.

Den (*Eng.*) A sandy tract near the sea, as at Exmouth and other places.

Den and Strond. A liberty for ships or vessels to run or come ashore. Edward I. granted this privilege to the barons of the Cinque-ports.

De Nautico Fœnore. Of nautical usury; bottomry.

Deneb. An Arabic word signifying the tail. It is used to designate a bright star in the tail of some of the constellations. Thus *α Cygni* is called *Deneb*, *β Leonis* is called *Denebola*, or simply *Deneb*, and there is also *Deneb Algedi* in Capricornus.

Denmark, Navy of. From the days of the Vikings, when the Danes ravaged the shores of Britain and Belgium, to the present hour, Denmark has always possessed a navy. The shores of the Baltic supply timber in abundance, and the natives of the kingdom are peculiarly adapted to a sea-life. Brave in temperament, of strong, muscular frames, and capable of much endurance and great self-sacrifice, the Danes combine the skill of navigators with the properly combative properties of seamen of men-of-war. But Denmark has not been fortunate in modern times. If not formidable in herself, she has been sufficiently strong to be coveted as an ally of Sweden, Russia, and France. On the first occasion of her confederacy with Sweden and Russia, to curb the naval power of Great Britain, she experienced a heavy check from Sir Hyde Parker, assisted by Lord Nelson. And later, in 1807, when there was reason to believe that Denmark was in alliance with the French emperor to damage the English, the latter sent a squadron to Copenhagen, and in anticipation of the purposes of the Danes destroyed their fleet. Since then no scope for the employment of a navy has presented itself. The hostile movements of Austria and Prussia within the last decade robbed her of the possession of Schelswig-Holstein, but the struggle with the German powers was limited to military operations on the land. But the energy of the government has been unceasingly employed to give strength to the nation by raising up a sufficient navy, and she now possesses a fleet of 30 steamers, 12 of which are ironclads, manned by 2880 seamen, engineers, and officers.

Density (Lat. *densus*, thick). A term used in physics to denote the quantity of matter which

a body contains under a given or determinate surface; for example, a cubic foot. The quantity of matter in any body is called its mass, and is measured by the weight of the body to which it is always proportional. Hence the density of any body is great in proportion as its weight is great and its volume small; or, the density of bodies are directly as their masses and inversely as their volumes. It follows also from the definition that if two bodies have the same volume their densities are directly as their masses or weights; and that if two bodies have the same mass or weight, their densities are respectively in the inverse ratio of their volumes. The density of a body is also proportional to its specific gravity.

Dental. A small shell-fish of the genus *Dentalium.*

Dentalium. A genus of gasteropods having a conical, slender shell, open at both ends.

Dentice. An excellent fish, so named from being well furnished with teeth. It is of the *Sparidæ* family, and frequents the Adriatic.

Department. A part or branch of the government; as, the legislative, the executive, and the judicial. Also, a part or branch of the executive power; as, the Department of State, of the Navy, etc.

The heads of the principal executive departments are the Secretary of State, the Secretary of the Treasury, the Secretary of War, the Secretary of the Navy, the Secretary of the Interior, the Postmaster-General, and the Attorney-General. These, by custom, constitute the President's cabinet. They are appointed by the President, by and with the advice and consent of the Senate, and are removable at pleasure.

Military Departments are territorial divisions embracing several posts; as, the Department of the East, of the Platte, etc.

Departure. The easting or westing made by a ship, or the distance in nautical miles which a ship makes to the east or west.

When the two positions are on the same side of the equator and do not differ very much in latitude, the departure is practically equal to the distance between the two meridians, measured on the parallel of middle latitude.

The departure is connected with the course and distance by the relation, *departure* = *distance* × *sin. course.* When the ship steers due east or due west, sin. course is equal to 1, and the departure is identical with the distance; when the course is due north or due south, sin. course is equal to zero, and the departure is equal to zero.

Departure, To Take a. To determine the exact position of the ship preparatory to starting on a voyage. This point may be determined by cross-bearings or by two bearings of three objects. When the land or lights are not visible, as in a fog, the position may be determined approximately by soundings, or by the sound of fog-horns, etc.

Depressed Pole. The pole below the horizon of the observer.

Depression of the Horizon. See Dip.

Depth of a Sail. The extent of a square-sail from the head-rope to the foot-rope, or the length of the after-leech of a stay-sail or boom-sail.

Depth of the Hold. The perpendicular height from the top of the ceiling in any ship to the top of the main deck, or upper beams at the centre of the ship; in single-decked vessels it is the total depth. In large merchant steamers (with three and more decks), the upper or saloon-decks are not counted in the depth of the ship as a rule.

Derelict (Lat. *derelictus*, abandoned). Anything abandoned at sea. A ship is derelict either by consent or by compulsion, stress of weather, etc., and yet, to save the owner's rights, if any cat, dog, or other domestic animal be found on board alive, the ship is not forfeited. The owner may yet recover, on payment of salvage, within a year and a day,—otherwise the whole may be awarded. See Salvage.

Derrick. A perpendicular spar supported by guys, and having a purchase attached for hoisting heavy weights.

Descending Squall. A fitful gust of wind issuing from clouds which are formed in the lower parts of the atmosphere. It is usually accompanied with heavy showers, and the weather-wise observe that the squall is seldom so violent when it is followed as when it is preceded by rain. See White Squall.

Descent. The landing of troops for the purpose of invasion. The passage down a stream.

Descriptive-list. A document which accompanies men when transferred or discharged. In it are noted the name, previous naval service and rating when last discharged, place of birth, age, trade or occupation, and a complete personal description of each man. When sent from a rendezvous it is signed by the commanding officer, but when sent from a vessel it is signed by both the executive and commanding officers.

Desert. To quit one's vessel, station, or duty without leave, and with the manifest intention not to return.

Deserter. One who deserts. See Desertion.

Desertion. The gist of this offense is the *intention not to return.* Absence without leave, with a probability that the party does not intend to desert, is at first to be regarded as straggling, and at the expiration of ten days, if the absence continue, as desertion. In either case the commanding officer is to decide the point of intention, and to cause the offender to be entered on the log and marked on the books of the pay-officer. In the merchant service an absence of forty-eight hours without leave is made conclusive evidence of desertion.

Detach. To relieve an officer, permanently, from any duty in which he may be engaged. In the army the word *relieve* has the signification just given for *detach*, but in the navy *relieve* is applied generally to a temporary relief from duty. See Relieve.

Detached Squadron. A squadron separated from the body of the fleet and sent on special service.

Detaching Apparatus. See Life-boats.

Detail. The body of officers or men ordered to any particular duty. To order to any special service.

Detonation. See Explosives.

Detroit is a port of entry, finely situated on the Detroit River, opposite Windsor (in Canada), 18 miles above Lake Erie, and 7 miles below Lake St. Clair. Lat. 42° 19′ 50″ N.; lon. 82° 58′

W. The river is here a half-mile wide, deep and clear, and serves admirably for harbor purposes. Pop. 119,700.

Development. In naval architecture, the art of delineating a plan of a ship in detail. In the mold-loft, the laying down of the ship from the plan ready for the mold-makers.

Deviation. The deflection of the compass from the magnetic meridian, due to local attraction. A voluntary departure from the usual course of the voyage without any necessary or justifiable cause,—a step which discharges the insurers from further responsibility. Liberty to touch, stay, or trade in any particular place not in the usual course of the voyage must be expressly stated in the contract, and even this is subordinate to the voyage. The causes of necessity which justify deviation are (1) stress of weather; (2) urgent want of repairs; (3) to join convoy; (4) succoring ships in distress; (5) avoiding capture or detention; (6) sickness; (7) mutiny of the crew. It differs from a *change* of voyage, which must have been resolved upon before the sailing of the ship. See COMPASS, THE MARINER'S.

Devil. A sort of priming made by damping and bruising gunpowder.

Devil-bolts. Bolts with false clinches, often introduced into contract-built ships.

Devil-fish. The *Lophius piscatorius*, a hideous creature, which has also obtained the name of fish-frog, monk-fish, bellows-fish, sea-devil, etc. There is also a powerful *Raia*, which grows to an immense size in the tropics, known as the devil-fish, the terror of the pearl-divers. The *Manta* of Spaniards.

Devil's-claw. A very strong kind of split hook made to grasp a link of a chain-cable, and used as a stopper.

Devil's Smiles. Gleams of sunshine among dark clouds, either in the heavens or in the captain's face.

Devil's Table-cloth. See TABLE-CLOTH.

Devil to Pay and no Pitch Hot. The seam which margins the water-ways was called the "devil," and the workmen found it difficult to calk. The phrase means "a difficulty to be overcome and no means of doing it."

Dew. When the temperature in the evening falls below the dew-point (which see), the vapor which can no longer be held in suspension is deposited on the surface of the earth, and is sometimes to be seen falling in a fine mist. This form of the phenomenon of dew is termed by the French *serein*, but there is another which they call *rosée*. The surface of the earth is constantly parting with its heat by radiation; when the sky is covered with clouds, the radiation sent back from the clouds nearly supplies an equivalent for the heat thus parted with; but if the sky be clear, no equivalent is supplied, and the surface of the earth becomes colder than the atmosphere. If the night be also calm, the small portion of air contiguous to the earth's surface will be cooled below the dew-point, and its moisture deposited on the surface in the form of dew. If this moisture be chilled below 32° F., the dew becomes frozen and is called hoar-frost.

DEW-POINT. The minimum temperature at which any assigned quantity of aqueous vapor can be held in suspension in the atmosphere.

Dholl. A kind of dried split pea supplied in India to ships.

Dhony, or Dhoney. A country trading-craft of India from 50 to 150 tons; mostly flat-bottomed. See DONEY.

Dhow. The Arab dhow is a vessel of about 150 to 250 tons burden by measurement,—grab-built, with 10 or 12 ports; about 85 feet long from stem to stern, 20 feet 9 inches broad, and 11 feet 6 inches deep. Of late years this description of vessel has been well built at Cochin, on the Malabar coast, in the European style. They have a great rise of floor; are calculated for sailing with small cargoes; and are fully prepared, by internal equipment, for defense,—many of them are sheathed on 2½-inch plank bottoms, with 1-inch board, and a preparation of chunam and oil, called *galgal*, put between; causing the vessel to be very dry and durable, and preventing the encroachments of the worm, or *Teredo navalis*. The worm is one of the greatest enemies in India to timber in the water, as the white ant (*termites*) is out of it. On the outside of the sheathing-board there is a coat of whitewash, made from the same materials as that between the sheathing and planks, and renewed every season they put to sea. They have generally one mast and a lateen-sail. The yard is the length of the vessel, and the mast rakes forward, for the purpose of keeping this ponderous weight clear in raising and lowering. The tack of the sail is brought to the stem-head, and sheets aft in the usual way. The halliards lead to the taffrail, having a pendant and treble purchase-block, which becomes the backstay, to support the mast when the sail is set. This, with three pairs of shrouds, completes the rigging, the whole made of coir rope. Several of these vessels were fitted as brigs, after their arrival in Arabia, and armed by the Arabs for cruising in the Red Sea and Arabian Gulf, as piratical vessels. It was of this class of vessel that Tippo Sultan's navy at Onore consisted. The large dhows generally make one voyage in the season, to the southward of Arabia; taking advantage of the northeast monsoon to come down, and the southwest to return with an exchange cargo. The Arabs who man them are a powerful, well-grown people, and very acute and intelligent in trade. They usually navigate their ships to Bengal in perfect safety, and with great skill.

Diacle. An old term for a boat-compass.

Diagonal Brace. A wooden or iron brace placed in a diagonal direction.

Diagonal Framing and Stays. A system of framing in which "struts" and "tie-rods" are arranged at such angles that the greatest stress upon them must be in direction of their length. In inverted-cylinder engines, diagonal stays are much used to connect the cylinders with the lower portions of the frame.

In wooden ship-building, diagonal trussing, consisting of flat wrought-iron bars arranged in a lattice form, is secured to the upper portions of the frames and to the deck-beams of the middle body of the vessel. In many vessels diagonal stays extend, between the stanchions, from the deck-beams to the keelson.

Diagonal Lines. The lines cutting the body plan diagonally from the timbers to the middle line.

Diagonal Ribband. A narrow plank made

to a line formed in the half-breadth plan of a ship on the mold-loft floor; by taking the intersections of the diagonal line with the timbers in the body plan to where it cuts the middle line in the diagonal direction, and applying it to their respective stations or frame-lines in the half-breadth plan, and to mark a spot at each station, to which spots a batten is bent, and a curve is formed, to which a ribband can be made as far as the cant bodies extend, and the square frame adjoining.

Diagonal Trussing. Sir Robert Seppings, in his "Improvement for Ships of War," about the year 1800, recommended that, instead of laying the interior planking on horizontal lines, the work should be laid diagonally; and in one of his plans he recommends a truss-frame of wood, in outline similar to the diagonal iron-strapping of to-day, in wooden ship-building.

Diameter, Apparent. The angle which the diameter of a heavenly body subtends. The *true* is the real diameter, commonly expressed in miles.

Diamond-knot. An ornamental knot worked with the strands of a rope, used on the foot-ropes of jib-booms, man-ropes, etc.

Dibbs. A galley-term for ready money. Also, a small pool of water.

Dice. Thus. See STEER.

Dichotomized. A term applied to the moon when her longitude differs 90° from that of the sun, in which position only half her disk is illuminated.

Dicky Sam. A cant term applied to an inhabitant of Liverpool.

Diego. A very strong and heavy sword.

Die on the Fin. An expression applied to whales, which when dying rise to the surface with one side uppermost.

Dieppe. A seaport town of France, Seine-Inférieure, at the mouth of the Arques, on the English Channel, and 33 miles N. of Rouen. Lat. of light-house, 49° 55′ 7″ N.; lon. 1° 5′ 2″ E. The port, inclosed by two jetties and bordered by quays, was small and inconvenient, but has been much enlarged and improved, so that it is now one of the best on the Channel. It has several spacious wet-docks. Pop. 19,500.

Difference of Latitude. See LATITUDE.

Difference of Longitude. See LONGITUDE.

Differences, Second. The differences in the successive values of a varying quantity (corresponding to equal intervals of time), if the quantity do not vary uniformly, exhibit differences among themselves,—these are called *Second Differences.* Thus, in a series of altitudes observed at equal intervals of time (since the altitude does not vary at the same rate at the begining, middle, and end of the interval), the differences between them, taken in succession, will generally exhibit second differences. So again with the elements tabulated in the Nautical Almanac. If these quantities varied uniformly in the interval between the dates for which their values are given, an intermediate value could be correctly interpolated by a simple proportion. The method of "proportional parts" would give the actual change in the interval between the date of one of the tabulated values and that for which we wish to interpolate. But the rate of varying itself varies during the interval, and hence, when great accuracy is required, the necessity for a correction to the change found by proportional parts, which correction is called the "*Equation of Second Differences.*" The question of finding the second difference is simply the finding the rate at which the rate of varying varies. This may be done by taking the two values from the table on each side the required one, and setting them down in order: then add together the 1st and 4th and the 2d and 3d, observing which sum is the greater: half the difference of the two sums is the second difference. The equation of second differences is found by the help of a table. This correction is of the most importance when the quantity under consideration attains a maximum between two times given in the table. The greatest error that can arise in any case from neglecting it is one-eighth of the whole second difference.

Dight. To set things in order; to dress and prepare for inspection.

Digit. A twelfth part of the diameter of the sun or moon; a term employed to denote the magnitude of an eclipse; as, so many *digits* eclipsed.

Dike. See DYKE.

Dill. An edible dark-brown sea-weed, torn from the rocks at low water.

Dillosk. The dried leaves of an edible sea-weed. See DULSE and PEPPER-DULSE.

Dilly-wreck. A corruption of *derelict* (which see).

Diminishing Plank. A plank which is smaller at one end than at the other.

Diminishing Strake. A strake of plank which is continually narrowing in width as it comes to the ends of the ship.

Diminishing Stuff. Tapering plank or boards.

Dimsel. A piece of stagnant water, larger than a pond and less than a lake.

Dinghey, Dinghy, or Dingy. A small boat of India, propelled by paddles, and fitted with a settee-sail, the mast raking forward. The smallest boat that a man-of-war carries; it is used for the light rough work.

Dingle. A sort of boat used in Ireland; a coracle.

Dinnage. See DUNNAGE.

Dip. To lower. *To dip the colors* is to run them down as a salute. An object is said to *dip* when it disappears below the horizon. A heavenly body is said to *dip* when it passes over the meridian.

DIP OF THE HORIZON. The angle through which the visible horizon is depressed below the sensible horizon in consequence of the elevation of the eye of the observer above the surface of the earth. This dip is a correction which must be applied to all altitudes taken at sea, and is calculated for all elevations likely to be used, and the results are arranged in tables. When the sea-horizon is hidden by land, the altitude has to be taken from the shore-line. The distance of this shore-line is estimated, and the dip is found by referring to a table of which the arguments are, "distance of the land" and "height of the eye." The amount of dip is affected by refraction, which raises the visible horizon; but the amount of consequent correction cannot be very accurately determined on account of the complication of the law of refraction near the horizon.

DIP OF THE NEEDLE. When the needle is

free to move vertically it forms an angle with the horizontal; this angle is called the dip, or inclination of the needle. The dip, like the variation, undergoes a cycle of change, and has also diurnal oscillations.

DIPPING NEEDLE. An instrument for measuring the inclination of the needle to a horizontal plane.

DIP-SECTOR. An ingenious instrument for measuring the true dip of the horizon.

Dipper. A name for the water-ousel (*Cinclus aquaticus*). A bird of the Passerine order, but an expert diver, frequenting running streams in mountainous countries.

Dipping-net. A hand-net used for taking small fish out of the water.

Direct Acting Engine. A term applied to an engine in which the motion of the piston is transmitted to a crank or pump plunger without the intervention of beams or levers, and distinguishing particularly the type in which the connecting-rod with its cross-head is between the cylinder and crank.

Direct Fire. See FIRE.

Direction. The direction of the wind is named after the point of the compass *from* which it blows. The direction of a current or stream is named after the point *towards* which it sets. A swell is named after the point from which the waves proceed, like the wind that produces them.

Dirk. A dagger or short sword worn by midshipmen.

Dirt-gabbard. A large ballast-lighter.

Dirty Aulin. See AULIN.

Disable. To deprive of ability or strength; to render unfit for service by the infliction of wounds or injury, — applied to persons and things.

Disarm. To deprive of weapons; to render harmless.

Disc, or Disk. The face of the sun, moon, or planet as it appears projected on the sky.

Discarcare (*Ital.*). An old term meaning to unload a vessel.

Discourse. An old sea-term meaning to traverse to and fro off the proper course.

Disembark. The opposite of embark; the landing of men from any vessel or boat.

Disembogue. The fall of a river into the sea; the word has also been used for the passage of vessels across the mouth of a river and out of one.

Disguise. Ships in all times have been permitted to assume disguise to impose upon enemies, and obtain from countries in their possession commodities of which they stand in need.

Disinfectants. These substances are of various kinds and act in various ways. Air and water are nature's great purifiers; but when these cannot act advantageously, it is necessary to apply some of the many powerful chemical agents which are available. The most convenient and efficacious are carbolic acid and its preparations, Condy's fluid, chloride of lime, and Burnett's solution. Chlorine is the most effective agent for fumigating a ship; it may be evolved from chloride of lime by moistening it with water or dilute sulphuric acid; it may also be obtained by pouring 4 parts of hydrochloric acid on 1 part of binoxide of manganese placed in a shallow vessel and gently heated.

In many cases the burning of sulphur will be found a simple and efficacious means of disinfecting a room. Infected clothing may be disinfected by plunging in boiling water, or by heating in an oven. Cloths saturated with a solution of chloride of lime may be hung up in an inhabited room to disinfect the air.

Disk. See DISC.

Di-slyng. See SLYNG.

Dismantled. The state of a ship unrigged, and all her stores, guns, etc., taken out, in readiness for her being laid up in ordinary, or going into dock, etc.

Dismasted. State of a ship deprived of her masts by accident or by design.

Dismount. To remove a gun from its carriage.

Dispart. The difference between the semi-diameters of those parts of a gun on which the sights are placed. *To dispart* a gun is to bring the line of sight parallel to the axis of the bore. This is done by erecting at some point on the gun forward of the base-ring a *dispart sight*, which is equal in height to the dispart plus the height of the rear sight. A wooden dispart sight was formerly sometimes lashed on the reinforce. Guns which are cylindrical for a certain distance give at once a line of sight parallel to the axis of the bore. Sights are now so fitted that when the head of the rear sight rests on the sight-box, the line of sight is parallel to the axis of the bore. In using a dispart it is necessary to point a certain distance above the target to make allowance for the fall of the projectile by the action of gravity; this distance, therefore, depending upon the time of flight of the projectile.

Dispatch-boat. A small, swift vessel for carrying dispatches.

Displacement. The weight of the water displaced by the immersed sides and bottom of a vessel.

Disrate. To reduce to a lower rating; to break a petty officer. See RATE.

Distance. The length in nautical miles of the rhumb-line joining any two places on the surface of the earth. On Mercator's chart the rhumb is represented as a straight line.

DISTANCE, SHORTEST. The length in nautical miles of the arc of a great circle passing through any two points on the earth's surface.

DISTANCE BETWEEN TWO HEAVENLY BODIES. This is not the absolute linear distance between the two bodies, but their angular distance measured on the arc of a great circle passing through both bodies. The *observed* distance is the reading of the instrument by which the measurement is made. This being cleared of "index error" and "semi-diameters" is the *apparent* distance. The apparent distance being cleared of "refraction" and "parallax" is reduced to the *true* distance, or the angle which is formed by two straight lines joining the bodies and the centre of the earth.

DISTANCE, LUNAR. The angular distance between the moon and any other heavenly body. See LUNAR DISTANCE.

Distemper. A preparation of opaque or body colors with size instead of oil. White distemper is used instead of whitewash (whiting 40 pounds, glue 6 pounds). Yellow distemper is used for smoke-stacks (whiting 40 pounds, glue 6 pounds, yellow ochre 80 pounds). The glue is made into size and added hot to the whiting and yellow

ochre, and sufficient water is added to give it the proper consistency.

Distiller. A name commonly applied to the condenser of a distilling apparatus.

Distilling Apparatus. An apparatus for extracting a liquid from its non-volatile impurities, such as may be held in solution or suspension, by means of evaporation and condensation. It consists principally of a retort, evaporator, or boiler, in which the pure liquid is vaporized, by heat, leaving behind the non-volatile substances, and a condenser in which the vapor is brought in contact with cold metallic surfaces and condensed to liquid again. The condenser is a vessel containing a "worm," or "nest of tubes," kept cold by the circulation of cold water on one surface while the other is exposed to the vapor. In large distillers the circulation of the refrigerating water is generally accomplished by a pump. The non-volatile substances are drawn from the boiler before the contained solution reaches the point of saturation. By this process sea-water is converted into fresh water, which, however, is not considered potable until it has regained its normal quantity of air held in suspension, much of which escapes if the water leaves the distiller at a high temperature. It is impossible to obtain absolutely pure water by a single distillation, as some impurities are carried mechanically with the vapor, particularly if the boiler "foams." Volatile matter, the vapor of which condenses at about the same temperature as that of water, cannot be eradicated by this process. In many steamships the steam used in the distiller is drawn from the main boilers, but it is desirable that the whole apparatus be independent of the main machinery. Distillers are generally provided with filters.

Distinguishing Pennant. Each vessel in a fleet is represented by a pennant which, hoisted with a signal, denotes the special vessel to which the signal is made. See SIGNALS.

Distress Signals. When a vessel is in imminent danger, she hoists her colors upside-down, fires guns, lets fly topgallant-sheets, and if at night, sends up rockets, burns signals,—in short, does anything to attract attention.

Ditty-bag. The name is derived from the *dittis*, or Manchester stuff of which it was formerly made. See BAG.

Ditty-box. A small box to hold a sailor's thread, needles, brushes, combs, etc. As ditty-boxes lumber up the decks, they are not generally allowed on board a man-of-war.

Diurnal Arc. That part of a circle described by a heavenly body from its rising to its setting.

Dive. To plunge head foremost into the water.

Diver. One versed in the art of descending under water to considerable depths and abiding there a competent time for several purposes, as to recover wrecks of ships, fish for pearls, sponges, corals, etc.

Divergent. A stream flowing laterally out of a river, contradistinguished from convergent.

Divie-goo. A northern term for the *Larus marinus*, or black-backed gull.

Divine Service. See ARTICLES FOR THE GOVERNMENT OF THE UNITED STATES NAVY (2, 3).

Diving. The subject of diving has not received the attention which it merits in our service. The necessary apparatus has at times found a place in the store-room equipment of our ships, but its practical use has been very infrequent. Want of trained divers has been our drawback. A good diver can command too good wages in civil life to allow of his enlisting in the navy, where if he were not a seaman he could only receive the rating of landsman. Diving is becoming every day of greater importance. In peace times hardly a month goes by in a cruising-ship that her safety, efficiency, or construction expenditure account might not be benefited by the presence on board of a few good divers. A valve becomes unseated, a leak is sprung and its location cannot be traced from inboard, a propeller is fouled, a cable is unshackled and an anchor lost, a steam-launch is dropped from the davits and sunk, a rifle or pistol is dropped overboard, sheets of copper become displaced or worn, the bottom becomes foul,—in all these cases a service diver might have been of great use and have prevented either loss, the borrowing of divers from foreign men-of-war or from the shore, or the docking of the ship. In war times divers become almost indispensable; besides the duties already suggested, they become invaluable for torpedo work.

Ours is the only service known to the writer where attention has not been paid to this valuable branch of the *personnel*.

In the British navy seamen-divers are trained on board the gunnery-ships "Excellent" and "Cambridge;" when qualified they receive 2 cents a day additional pay,—for the time that they are actually employed under water they receive 48 cents an hour,—this is, of course, in addition to the pay they may receive for the ship's rating they hold. Besides the seaman-divers there is a class of mechanical divers taken from the engineer's and carpenter's crews. These receive 2 cents a day like the seamen, and when employed under water 62½ cents. The number of divers varies with the complement, ranging from 2 to 6 seamen-, and about the same number of mechanical divers. The "Triumph," flag-ship of the Pacific Squadron, had 6 seamen- and 4 mechanical divers. All ships commanded by post-captains carry one diving apparatus, flag-ships two. Vessels fitted for special service as many as may be thought necessary. Each apparatus will supply air to two men under water at a depth not exceeding 10 fathoms. The men who are placed under instruction are selected from among volunteers, great attention being given to their physical condition, as perfect health is required for diving. Officers are instructed at their own request, and are allowed additional compensation for the accomplishment. It can readily be understood that it would be of the utmost importance in some cases to be able to use the eyes and intelligence of an officer.

In the French service divers are instructed aboard the receiving-ships in each of the naval ports. The men for instruction are drawn from the engineer's, carpenter's, and seamen divisions, being first subjected to a rigorous physical examination. After the regular course of instruction they are forced to keep themselves in constant practice, and are examined at stated intervals. Prizes are offered for different feats of diving at the yearly prize contests, which take place aboard every vessel in commission. There

is no continuous additional pay, but each time that a man is employed under water he receives 60 cents plus 1 cent for every minute employed. Every screw-vessel carries a complete apparatus, and additional ones are allowed when it is thought proper. The "Victorieuse," flag-ship of the Pacific Station, had 14 divers. It may be interesting to note that her bottom was thoroughly cleaned by four of her own men in three days at a cost to the government of $72.75, whereas at the same time it was found that to clean the "Pensacola's" bottom would have cost our government nearly $1000, she having no divers.

In the Italian service there is a regular corps of torpedo men, whose education as machinists and seamen combined fits them for submarine work. These men are all divers, being instructed at the Royal Torpedo School. They receive from 40 to 80 cents for each hour of work, according to their rating and proficiency. The frigate "Garibaldi," of the Pacific Station, had 14 divers.

In the German service there are diving-schools at Kiel and Wilhelmhaven, where a large number of machinists and artificers are instructed. The instruction is very thorough. These men receive about 60 cents for each hour of submarine work. No continuous remuneration. The iron-clad corvette "Hansa," Pacific Station, had on board 12 trained divers.

The Chilian service is supplied with divers from the English service, and during the present war has found them of the greatest use.

The Peruvian service had no divers until the loss of the "Huascar" caused them to see the great necessity of clean bottoms; they have now supplied the deficiency with foreigners.

The Denayrouze apparatus is used in all the services cited. It consists of an air-pump, a receiver and reducer, a diving costume, and the necessary hose, signal-tubes, ropes, weights, ladders, and tools. A submarine lamp is also provided. A new form of the apparatus adopted in the Italian service allows the diver to disconnect himself from the pump, carrying a supply of condensed air in a magazine on his back. This is a valuable accessory for torpedo work.—*Theo. B. M. Mason, Lieutenant U.S.N.*

Diving-bell. A hollow vessel, sometimes bell-shaped, in which a person may descend and remain for a time below the surface of the water; it is said to have been used by the Phœnicians 320 B.C.

Division. A secondary group of ships in a fleet. (See Fleet Tactics.) A sub-classification of the ship's company; as, the powder division, master's division, the gun divisions, etc.

Doa. A Persian trading-vessel.

Doasta. An inferior spirit, often drugged or doctored for unwary sailors in the pestiferous dens of filthy Calcutta and other seaports in India.

Dob. The animal inhabiting the razor-shell (*Solen*), used as a bait by fishermen.

Dobber. The float of a fishing-line.

Dobule. A fresh-water fish, allied to the roach.

Dock. An artificial basin or inclosure for the reception of shipping, either for the purpose of loading, unloading, building, or repairing.

Docks may be divided into two general classes —*wet* and *dry*. Wet-docks are constructed for the purpose of facilitating the lading and unlading of vessels, and for the better preservation and storage of merchandise. They also afford a place of safety in which vessels can lie without exposure to the dangers of an open roadstead, the rapid current of rivers, or extreme changes of tide. In ports which occupy central commercial positions, but which enjoy but few natural advantages, such improvements in the accommodation of shipping give them greater importance and encourage maritime enterprise.

Vessels are admitted into wet-docks through a gate at high tide, which, being closed, the water within is retained at a constant depth, not being affected by the changes of tide without.

The most extensive systems of wet-docks in the world are found in England. At Liverpool 37 wet-docks have been constructed; the whole dock water-space covering an area of 239 acres, while the quay-space is 16 miles in extent. At Birkenhead, on the southwest side of the Mersey, directly opposite to Liverpool, docks have been constructed with a water area of 165 acres, and an extent of nearly 11 miles of quay. These docks are connected one with another, and most of them have connections with the Mersey.

The docks of the Thames are built upon both sides of the river, and cover an area of 235 acres. Hydraulic power is used in the docks of London and Liverpool, by which the cranes, capstans, and gates are moved, and warehouses of magnificent construction and dimensions are built upon the quays. Stringent rules are enforced regarding the use of fire on board the vessels as a precaution against conflagrations. Wet-docks of less extent are found in all of the important sea-ports of Great Britain, in the French ports of Havre, Brest, Toulon, and Cherbourg, and in many ports of the Baltic Sea.

The Atlantic dock, at Brooklyn, L. I., is another example of a wet-dock. The whole area occupied is about 80 acres, 42 of which is water-surface. The basin is inclosed by piers 150 feet wide, and that pier which divides it from the East River has an entrance 200 feet in width. Warehouses are built upon the piers, and in some portions the depth of water is 25 feet at low tide.

Dry-docks include all structures which are used for the examination, repairing, or building of vessels, as graving-docks, floating-docks, hydraulic-docks, etc. The graving-dock at the navy-yard, in Brooklyn, is one of the largest in the United States. It is of granite, and was completed in 1851, having been ten years in building. The main chamber is 286 feet long and 30 feet wide at the bottom, and 307 feet long and 98 feet wide at the top. The width of the entrance is 68 feet, and depth of water at high tide 26 feet. The entrance is closed by a floating-gate or caisson 66 feet long, 16 feet beam, and 30 feet in depth, which is held in position by the keel at each end entering a vertical groove in the masonry at each side of the entrance. It is lowered or raised by admitting the water or pumping it out.

Turning-gates are also used in addition to the caisson, when circumstances require, but if they are left open, an additional length of 52 feet can be obtained for dock room. The engines for emptying this dock are of sufficient power to

pump 610,000 gallons of water in two hours and ten minutes.

The graving-docks at the Boston and Norfolk navy-yards are similar to that above described, but are of less dimensions, the floors of the main chambers being 228 feet long and 30 feet wide. By using the space between the caisson and turning-gates, a total length of 306 feet can be obtained.

Two graving-docks have been built at South Brooklyn, L. I. No. 1 is 500 feet long, with a width at the bottom of 60 feet, and can admit vessels at high water drawing 18 feet. No. 2 is 447 feet long, and admits vessels at high water drawing 22 feet, and at low water, 17 feet. The latter dock may be divided in two parts by means of a central gate, serving the purpose of two separate docks. These docks are emptied by a horizontal engine of 100 horse-power, connected with a double centrifugal pump capable of ejecting 40,000 gallons of water per minute, and by two oscillators, which are used for drainage, having an average capacity of 1000 gallons per minute.

Floating balance dry-docks have been built at the Portsmouth and Pensacola navy-yards, and there is a floating sectional dry-dock at the navy-yard at Mare Island, Cal. The latter consists of 10 sections, each 100 feet long, 32 feet broad, and 11 feet 9 inches high, with two end-floats to each section, each 26 feet 8 inches long, 15 feet wide, and 8 feet high. There is also a stone basin and two marine railways extending from one side. The sections can be used as two separate docks, 6 sections being sufficient to lift a ship of the largest class in the navy, while a smaller one can be docked upon the four remaining sections. A ship of the largest class can also be received upon each of the railways, thus making the dock capable of receiving four vessels at once. The displacement of this dock is 11,040 tons, and its lifting capacity about 5000 tons.

Balance-docks are so called on account of the means which are provided for retaining them at an exact level by pumping water out or letting it into the compartments of the side chambers. The balance-docks at the Portsmouth and Pensacola navy-yards are a combination of the caisson and camel, and are alike, except that the latter is provided with extra fixtures for steadying vessels when it is used as a camel for carrying vessels across the bar. They are 350 feet long, 105 feet 4 inches wide, and 38 feet deep. The interior width is reduced to 90 feet by the chambers on each side, which have a width of 7 feet 8 inches. These docks are capable of lifting ships of the largest size. Preparatory to receiving a ship the dock is sunk by pumping water into it until it is full to the deck, and then into the chambers, the water operating as ballast and sinking the dock to the required depth. To sink it sufficiently to receive a ship of 2000 tons displacement, it is necessary to pump 240 tons of water into each side chamber. When the ship is in position for lifting, the water ballast is drawn off by opening valves in the lower side chambers, causing the dock to rise until it touches the bottom of the ship. The water is then pumped out of the side chambers and bottom tank, and the dock rises with its load. The time required for docking a ship of 2000 tons displacement is about two hours.

A new iron sectional dock is in process of construction by John Roach & Sons, of Chester, Pa., to replace the balance-dock at Pensacola.

Sectional, balance, and docks of other descriptions have been constructed in all of the important seaports of the United States. The Sectional Dock Co. of New York owns 18 sections, any number of which may be used for a single ship as required.

The largest floating-dock in the world is at Bermuda, where it was towed from England in June, 1864. It has an extreme length of 381 feet, and an inside length of 333 feet. Width over all, 123 feet 9 inches, and inside width, 83 feet 9 inches. Its depth is 74 feet 9 inches, and weight 8350 tons. It is capable of lifting the largest class of armored vessels. It is a balance-dock, having the space between the two skins divided into 48 water-tight compartments, by means of which, with the side chambers, the structure is sunk or raised, and retained in a level position.

The "Simpson docks," which have been constructed at Portland, East Boston, New York, Baltimore, and Chester, are similar to the graving-dock, but are built of wood instead of stone. By the use of this material these docks can be enlarged as the future needs of shipping may require at a comparatively small expense, while the first cost of construction is much less.

The most modern system of dry-docks is that which has been constructed at Nicolaieff, Russia, by Messrs. Clark, Stanfield & Co., upon the recommendation of Admirals Lesovsky and Popoff, of the Russian navy.

The lifting portion of this dock consists of 14 pontoons attached to a lateral side. To this side a floating outrigger is attached to give it greater stability. The side is composed of three parts, any two of which, with its corresponding number of pontoons, is capable of lifting a vessel of the smaller class, or the remaining third section if it should require repairs. For vessels of great length all of these sections can be used; but for vessels of extreme breadth of beam, as the circular ironclads of the Russian navy, the pontoons at the extremities of the dock can be detached and joined to the ends of the pontoons which remain fixed to the structure, thus forming an area corresponding in shape to that of the vessel. A number of transverse apertures are made in the dock, to allow of the entrance of corresponding rows of piling in the landing-stage or dock upon which the vessel is to be deposited. The vessel having been lifted and placed in position over the landing-stage, the floating-dock is sunk and removed, and can then be used for docking other vessels.

The great advantages of this system are that it is capable of being extended for lifting vessels of any size or model, and that the accommodations for docking vessels are only limited by the extent of the pilings upon which the vessels are placed.—*E. T. Strong, Lieutenant U.S.N.*

Dock-dues. The charges made upon shipping for the use of docks.

Dock Herself. When a ship is on the ooze and swaddles a bed, she is said to dock herself.

Docking a Ship. The act of drawing her into dock and placing her properly on blocks, in order to give her the required repair, cleanse the bottom, and cover it anew. See Breaming.

Dock-yards. Arsenals containing all sorts of naval stores and timber for ship-building. In England the royal dock-yards are at Deptford, Woolwich, Chatham, Sheerness, Portsmouth, Devonport, Pembroke. Those in her colonies are at the Cape of Good Hope, Gibraltar, Malta, Bermuda, Halifax, Jamaica, Antigua, Trincomalee, and Hong-Kong. There her majesty's ships and vessels of war are generally moored during peace, and such as want repairing are taken into the docks, examined, and refitted for service. These yards are generally supplied from the north with hemp, pitch, tar, rosin, canvas, oak-plank, and several other species of stores. The largest masts are usually imported from New England. Until 1831 these yards were governed by a commissioner resident at the port, who superintended all the musters of the officers, artificers, and laborers employed in the dock-yard and ordinary; he also controlled their payment, examined their accounts, contracted and drew bills on the Navy Office to supply the deficiency of stores, and, finally, regulated whatever belonged to the dock-yard. In 1831 the commissioners of the navy were abolished, and admirals and captains superintendent command the dock-yards under the Controller of the Navy and the Admiralty. See Establishments, Naval.

Dock Up, or Duck Up. To clew up a corner of a sail that hinders the helmsman from seeing.

Doctor. A medical officer. See Surgeon.

Doctor's List. See Sick-list.

Dodman. A shell-fish with a hod-like lump. A sea-snail, otherwise called *hodmandod.*

Do For. A double-barreled expression, meaning alike to take care of or provide for an individual, or to ruin or kill him.

Dog. The hammer of a firelock or pistol; that which holds the flint, called also dog-head. A sort of iron hook or bar with a sharp fang at one end, so as to be easily driven into a piece of timber, and drag it along by means of a rope fastened to it, upon which a number of men can pull. *Dog* is also an iron implement with a fang at each end, to be driven into two pieces of timber to support and steady one of them while being dubbed, hewn, or sawn. *Span-dogs.* A pair of dogs linked together, and being hooked at an extended angle, press home with a great strain. *To dog* a rope is to fasten it to a spar or cable in a peculiar manner, causing the parts to bind on each other and thus prevent slipping.

Dog-bitch-thimble. An excellent contrivance by which the topsail-sheet block is prevented making the half cant or turn so frequently seen in the clew when the block is secured there.

Dog-bolt. A round piece of iron driven into a hole which has been bored for the purpose, and the wedges are driven against this bolt; they are used in planking wooden ships.

Dog-drave. A kind of sea-fish mentioned in early charters.

Dog-fish. A name commonly applied to several small species of the shark family.

Dogg. A small silver coin of the West Indies, six of which make a bit.

Dogger. A Dutch smack of about 150 tons, navigated in the German Ocean. It is mostly equipped with a main- and a mizzen-mast, and somewhat resembles a ketch or a galliot. It is principally used for fishing on the Dogger Bank.

Dogger-fish. Fish bought out of the Dutch doggers.

Dogger-men. The sea-faring fishermen belonging to doggers.

Dogs. The last supports knocked away at the launching of a ship.

Dog's-body. Dried pease boiled in a cloth.

Dog's-ear. A small bight made in the leech-rope of a sail in reefing, making up, etc. See Awning.

Dog-shore. A piece of timber which used to be placed at the forward end of the launching-ways; it was intended to hold the ship until all was ready for launching. It was placed in a diagonal position, with one end to the ground or immovable ways. Both ends were rounded so that it could be readily knocked out when the word was given.

Dog-sleep. The uncomfortable fitful naps taken when all hands are kept up by stress.

Dog's Tail. A name for the constellation Ursa Minor, or Little Bear.

Dog-star. The popular name of *a Canis Majoris.* See Sirius.

Dog-stopper. A stopper put on before all to enable the men to bitt the cable, or to fleet the messenger.

Dog-tongue. A name assigned to a kind of sole.

Dog-vane. A small vane made of thread, cork, and feathers, or bunting, fastened on the end of a half-pike, and placed to windward, so as to be readily seen, and show the direction of the wind. The term is also familiarly applied to a cockade.

Dog-watch. The half-watches of two hours each, from 4 to 6, and from 6 to 8, in the evening. By this arrangement an uneven number of watches is made,—seven instead of six in the twenty-four hours; otherwise there would be a succession of the same watches at the same hours throughout the cruise. See Watch.

Dog-whelk. The name given by fishermen to the *Nassa reticulata,* a common species of univalve shells.

Doit. A small Dutch coin, valued at about half a farthing.

Doldrums. Those parts of the sea where calms are known to prevail. They exist between and on the polar sides of the trade-winds, but vary their position in the course of the year, depending upon the sun's declination. Also applied to a person in low spirits.

Dole. A stated allowance; but applied to a scanty share or portion.

Doling. A fishing-boat with two masts, on the coasts of Sussex and Kent; each of the masts carries a sprit-sail.

Do-little, or Do-little Sword. The old term for a dirk.

Dollop. An old word for a lump, portion, or share. From the Gaelic *diolab.*

Dolphin. Naturalists understand by this word numerous species of small cetaceous animals of the genus *Delphinus,* found in nearly all seas. They greatly resemble porpoises, and are often called by this name by sailors; but they are distinguished by having a longer and more slender snout. The word is also generally, but less correctly, applied to a fish, the dorado (*Coryphœna hippuris*), celebrated for the changing hues of its body when dying. A small light ancient

boat, which gave rise to Pliny's story of the boy going daily to school across the Lucrine Lake on a dolphin. In old ordnance, especially brass guns, two handles nearly over the trunnions for lifting the guns by. A French gold coin (*dauphine*), formerly in circulation. A stout post on a wharf or beach to which hawsers are made fast. A kind of wreath or strap of plaited cordage. A permanent fender around a heavy boat just below the gunwale. The name is also given to a spar or block of wood, with a ring-bolt at each end, through which a hawser can be rove, for vessels to ride by; the same as wooden buoys.

DOLPHIN-STRIKER. A short perpendicular spar under the bowsprit, giving spread to the upper head-stays.

Domestic Navigation. The coasting and inland trade.

Domicile. A residence at a particular place, accompanied by positive or presumed proof of an intention to remain there for an unlimited time. The residence to create it may be short or long, according to circumstances; the determining consideration is the intention of remaining, or the contrary. The original domicile of a person always continues until he has fairly changed it for another, and to effect such change there must be a union of intention and act. Domicile may arise either from birth, from the domestic relations, or from election. The domicile of birth remains until a subsequent one is acquired. A woman on marriage takes the domicile of her husband. The husband's change of domicile changes that of his wife, and the parent also possesses the power of changing the domicile of his minor child by changing his own. The necessarily migratory lives of naval and military men makes the subject of domicile of peculiar interest to them. The disposition, distribution, and succession of personal property are governed by the law of the owner's or intestate's domicile at the time of his death, and not by the conflicting laws of the various places where the goods happen to be situated. See INTERNATIONAL LAW.

Don. A general name for Spaniards. *To don*, to put on.

Donaldson, Edward, Rear-Admiral U.S.N. Born in Maryland. Appointed midshipman, October, 1834, and went to West Indies in "St. Louis," and returned following year in the "Falmouth"; went out in the fall of 1835 to the West Indies, in the "Warren"; transferred to the "Vandalia," and continued until 1838; in frigate "Columbia," East Indies, 1839–40; while attached to her, took part in the attacks on forts on the coast of Sumatra, 1839.

Promoted to passed midshipman, June 22, 1841; in McLaughlin's Mosquito Fleet, in Florida, 1841–42; in brig "Truxtun," 1843–44; sloop "Erie," coast of Africa, 1845; on the coast survey in 1846; cruise in sloop "Plymouth," East Indies, 1847–48.

Commissioned as lieutenant, October 23, 1847; in brig "Dolphin," East Indies, 1849–50; at rendezvous, Baltimore, 1852; in steamer "Water-Witch," river La Plata, 1853–54; steam-frigate "Merrimac," special service, 1856–57; receiving-ship at Baltimore, 1858–59; in steamer "San Jacinto," coast of Africa, 1860–61; rendezvous, Philadelphia, 1861; commanding steam-gunboat "Scioto," West Gulf Squadron, 1861–62; bombardment, etc., of Forts Jackson and St. Philip, and capture of New Orleans, April, 1862, and other operations in the river.

Commissioned as commander, July 16, 1862; commanding receiving-ship at Philadelphia in 1862–63; steamer "Keystone State" in trip to the West Indies in search of the "Sumter"; commanding steamer "Keystone State," North Atlantic Squadron, 1863–64; commanded the steam-sloop "Seminole" at the battle of Mobile Bay, August 5, 1864; ordnance duty, Baltimore, 1865.

Commissioned as captain, July 25, 1866; commanding receiving-ship at Baltimore, 1866–68; at New York Navy-Yard, March, 1869, to February, 1870.

Commissioned as commodore, 1871.

Commissioned as rear-admiral, 1876, and retired the following year.

Donderbass. A Dutch name for *bombard.*

Doney. The doney of the Coromandel coast is about 70 feet long, 20 feet broad, and 12 feet deep; with a flat bottom or keel part, which at the broadest place is 7 feet, and diminishes to 10 inches in the siding of the stem and stern-post. The fore and after bodies are similar in form from midships. Their light draft of water is about 4 feet, and when loaded about 9 feet. These unshapely vessels trade from Madras and Ceylon, and many of them to the Gulf of Manar, as the water is shoal between Ceylon and the southern part of the continent. They have only one mast, and are navigated by the natives in the rudest way, their means for finding the latitude being a little square board, with a string fast to the centre, at the other end of which are certain knots. The upper edge of the board is held by one hand so as to touch the north star, and the lower edge the horizon. Then the string is brought with the other hand to touch the tip of the nose, and the knot which comes in contact with the tip of the nose tells the latitude.

Donkey-engine. A small auxiliary steam-engine for performing other work than that of propulsion, such as supplying power to blowers, lathes, steam-winches, capstans, etc. It is generally provided with an independent boiler suitable to its size; but, on shipboard, its steam is sometimes drawn from the main boilers.

Donkey-pump. An auxiliary pump independent of the main engines, used for feeding boilers, extinguishing fire, for which purpose nozzles for connecting fire-hose are attached, circulating water through a distilling apparatus, and pumping water from the bilge of a ship.

Donny. A small fishing-net.

Doolah. A passage-boat on the Canton River.

Dooted. Timber rendered unsound by fissures.

Dorado. The *Coryphœna hippuris*, an oceanic fish, often called "dolphin." See CONSTELLATION.

Dorey. A flat-floored cargo-boat in the West Indies named after the fish "John Dory."

Doria, Andrea, was born in Oneglia, of which his family were princes, in 1468. Descended from one of the noblest Genoese houses, which had been celebrated for many generations, the great admiral numbered among his ancestors the Admiral Lamba Doria, who gained the bloody victory of Curzola, over the Venetians, under

Dandolo, in 1298; Philippi Doria, a distinguished naval commander, whose name was, however, stained by political crimes; and Paganino Doria, a great admiral (1351), who repeatedly defeated the Venetians, under Pisani. Lastly came Peter Doria, who was killed in action with the Venetian fleet.

Andrea Doria, the greatest seaman the state of Genoa ever produced, was forced, when a young man, by the banishment of his family from Genoese territory, to enter the service of the Pope, from which he passed into that of several other Italian princes. Having gained military and political experience, he became a knight of St. John of Jerusalem, and made a pilgrimage there, upon his return espousing the cause of Charles VIII. against the Spaniards.

The latter were commanded by Gonsalvo de Cordova, who so much admired Doria's prowess that he tried, in vain, to draw him over to the Spanish side.

At last Doria was enabled (by the withdrawal of the decree of banishment) to enter the service of his own country. After subduing a formidable rebellion in Corsica, he was given command of the Genoese navy, which he thoroughly reorganized. After this he was active in repressing the Barbary corsairs,—the terror of all nations at that time. Once more banished from Genoa, he again entered the service of France,—Francis I. making him "general of the galleys of France." In this capacity he fought the Imperial fleet, raising the blockade of Marseilles, and having other successes. After the battle of Pavia he pursued the Spanish fleet which carried Francis a prisoner; but the latter sent him word to desist from attack, as he had given his parole not to escape.

Doria next, in the name of Francis, seized Genoa,—which was torn by factions,—and established peace there. Francis wishing to make of Savona a rival port to Genoa, Doria protested against it, and the king ordered his arrest; but, strong in the fleet, Doria easily escaped, and sent his commission to the French king. Irritated by this injustice, he then passed over to the service of the Emperor Charles V., and was the means of destroying the vestige of French power in Italy, delivering Genoa in 1528.

A general peace soon followed, and Doria busied himself in composing the troubles in his native land, refusing the title of doge, and abolishing the life-tenure of that office. He might then have had absolute power in Genoa had he chosen. Unfortunately, the oligarchy was strengthened by his actions, and, under the name of a republic, existed until Napoleon's time.

Charles V. loaded Doria with honors and riches; gave him the order of the Golden Fleece; made him Prince of the Empire, and General of the Marine, with absolute authority. He continued to serve against the Turks, the Algerines, and the French, occupying the very foremost place in all the great events of the time.

As a seaman he was, without doubt, the first of his period; and, although he had been a free lance, and had served many masters, he has never been charged with betraying any one of them.

Genoa owed her existence as a state to him, and recognized the obligation by voting him "The Father and Liberator of his Country." In his latter days, however, fresh troubles and dissensions arose, and Doria became the object of great hatred and dangerous conspiracies by some of the oligarchy, so that the latter part of his life was stained by lamentable cruelty and bloodshed. He died in 1560, at the great age of 92.—*E. Shippen.*

Dornicle. A name for the viviparous blenny.

Dorra. From the Gaelic *dorga;* a crab-net.

Dorsal Fin. The median fin placed upon the back of fishes.

Dory. A fish, *Zeus faber*, commonly known as "John Dory," or truly *jaune dorée*, from its golden hues.

Double. Two of a sort taken together; having two similar parts. To increase by the addition of the same quantity. To cover a portion of the ship with an extra planking,—applied only when the extra planking is not less than two inches thick. *To double* a cape, to sail round it. *To double on the tub*, to get twice one's share by sharp practice. *To double upon*, in a naval engagement is to inclose a portion of the enemy's fleet between two fires.

DOUBLE-ACTION. See ACTION.

DOUBLE ALTITUDE. See ALTITUDE.

DOUBLE-BANK. *To double-bank* a rope is to clap men on both sides of it. See BANK.

DOUBLE-BITT. To take two turns of the cable around the bitts.

DOUBLE-BLOCK. A block having two sheaves.

DOUBLE-CAPSTAN. A capstan so constructed as to be worked from both decks.

DOUBLE-CROWN. See CROWN.

DOUBLE-DECKER. A man-of-war having two gun-decks.

DOUBLE DUTCH COILED AGAINST THE SUN. Gibberish; unintelligible language.

DOUBLE-EAGLE. A gold coin of 20 dollars.

DOUBLE-FUTTOCKS. Two futtocks in one.

DOUBLE-HEADED MAUL. A maul with two faces.

DOUBLE-HEADED SHOT. Two whole balls connected by a bar. See BAR-SHOT.

DOUBLE-IRONS. Fetters for both hands and legs. See IRONS.

DOUBLE-JACK. See JACK-SCREW.

DOUBLE-LAND. The appearance of the coast when the sea-line is bounded by parallel ranges of hills rising inland, one above the other.

DOUBLE-SIDED. A double-decked ship painted so as to show both rows of ports; or, a merchant vessel painted to resemble a double-decker.

DOUBLE SPANISH BURTON. See SPANISH BURTON.

DOUBLE-STAR. Two stars so close together that the angle between them is inappreciable except by means of a telescope.

DOUBLE-STRAP. See STRAP.

DOUBLE-TIDES. *Working double-tides*, doing extra duty.

DOUBLE WALL-KNOT. See WALL-KNOT.

DOUBLING. Planking ships' bottoms twice with two thicknesses of plank. That portion of two masts included between the trestle-trees and cap is termed the *doublings* of the masts.

Doubloon. A Spanish gold coin. See MONEY.

Dough-boy. A hard dumpling boiled in salt water,—a corruption of *dough-ball.*

Douse. To plunge into the water; to dip.

To lower; as, to douse sail. To cover up or extinguish; as, to douse a light.

DOUSER. An extinguisher.

Dousing-chock. A piece fayed across the apron, and lapped in the knight-heads, or inside planking, above the upper deck.

Dout. To put out a light.

DOUTER. An extinguisher.

Dover. A town of England, county of Kent, one of the Cinque Ports, on the N.W. side of Dover Strait, 66 miles E.S.E. from London. Lat. 51° 7′ 8″ N.; lon. 1° 19′ 5″ E. The harbor consists of three basins, the outer one inclosed between two piers 150 feet apart. Dover has been made a harbor of refuge by throwing out jetties of great magnitude, and a granite pier one-third of a mile long, and still unfinished, into the sea. Dover being one of the chief ports of communication between England and the continent, has continual intercourse by steamboats with Calais and Boulogne. Ship-building, sail- and rope-making employ many of the population. Dover is the principal of the Cinque Ports. Pop. 29,000.

Dovetail. A score in the end of a piece of wood resembling a dove's tail, and into which a corresponding piece is fitted, for the purpose of securing two pieces, which are placed at right angles with each other.

Dowbrek. A name for the spirling, or smelt.

Dowel. A method of coaking by the use of a round piece of hard wood, instead of an oblong piece, one-half the length of the dowel being let into each piece; when two pieces of timber, as in the frame of a ship, are to be secured together, the fastenings are sometimes driven through the dowels.

Down! To come, take, put, or haul down. *To bring the sun down* is to bring in contact the horizon and the image of the sun reflected in a sextant.

DOWN BAGS! The order from the boatswain's mate for the men to stow away their bags in the proper place.

DOWN BOOMS! The order to lower the stun'-sail booms when the sails are furled.

DOWN FROM ALOFT! The order for the men to come down after furling, reefing, etc. No manœuvre is completed until the last man is on deck.

DOWN-HAUL. A rope to haul down, or assist in hauling down, a sail. A stay-sail down-haul is secured to the head cringle of the sail, and leads thence through the hanks, and a leading-block at the tack, to the deck. A try-sail down-haul is made fast to the upper after-corner of the sail, and leads thence through a block at the jaws of the gaff to the deck. A gaff-topsail down-haul (and clewline) is made fast to the clew, and leads thence through a block at the head to the deck. A topgallant studding-sail down-haul is bent to the yard-arm, and leads abaft into the top. A topmast studding-sail down-haul is bent to the outer yard-arm, and reeves thence through a thimble in the leech and a block at the tack, forward of all, to the deck.

DOWN HELM! Put the helm a-lee!

DOWN IN THE MOUTH. Low-spirited; disheartened.

DOWN KILLICK! Let go the killick or anchor!

DOWN WIND, DOWN SEA. A proverbial expression among seamen in the tropics, where the wind soon gets up a sea, which soon goes down when the wind abates.

Downs. An accumulation of drifted sand, which the sea gathers along its shores. The name is also applied to the anchorage or sea-space between the eastern coast of Kent and the Goodwin Sands, the well-known roadstead for ships, stretching from the South to the North Foreland, where both outward- and homeward-bound ships frequently make some stay, and squadrons of men-of-war rendezvous in time of war. It is defended by the castles of Sandwich, Deal, and Dover.

D. R. Dead-reckoning.

Drabler. A piece of canvas laced on the bonnet of a sail to give it more drop. "As the bonnet is to the course, so in all respects is the drabler to the bonnet." It is only used when both course and bonnet are not deep enough to clothe the mast.

Draco (*Lat.* "The Dragon"). A winding constellation, which, commencing from between Ursa Major and Ursa Minor, extends to Lyra. The two principal stars, γ and β, form a conspicuous pair, situated nearly on the line joining *α Lyræ* and *α Ursæ Majoris;* the line which joins *α Cygni* and *β Boötis* also passing near them. *γ Draconis*, also called *Rastaban*, is the nearest one to Lyra; it is of historical interest as being the star used by Bradley in the discovery of aberration.

Dracunculus. A species of fish about 10 inches long, of a reddish-brown color above, and white beneath; sordid dragonet; sculpin; *Callionymus dracunculus.*

Draft. See DRAUGHT.

Drag. Anything towing in the water to retard a ship's progress, or to keep her head up to the wind. A drag-rope. A sea-anchor. A creeper.

To drag for an anchor or chain is to endeavor to pick it up by means of a grapnel or bight of a rope. A ship *drags* her anchor when the wind, tide, or current causes her to go astern, trailing the anchor over the bottom.

DRAG-NET. A trawl or net to draw on the bottom for flat-fish.

DRAG-ROPE. The rope by which are hauled about Gatlings, howitzers, etc., on field-carriages.

Dragoman. The name for a Turkish interpreter; it is corrupted from *tarij-man.*

Dragon. An old name for a musketoon.

Dragonet. A sea-fish, the gowdie, or *Callionymus lyra.*

Dragon-volant. An old name for a gun of large calibre.

Drag-saw. A cross-cut saw.

Drake, Sir Francis. Born in 1539, on the banks of the Javy, in Devonshire, England. A sea-rover in the service of Queen Elizabeth of England. Plunder and prize-money had greater charms for Drake than honor and glory. The earliest mention made of him refers to a voyage in 1572, when, reaching the Caribbean Sea, he landed on the Isthmus of Darien, and beholding the Pacific from a lofty eminence, he prayed that the Almighty would grant him life and leave to sail once an English ship on that sea. His prayer was heard. Four years later he sailed from England with five ships, and passing along the coast of South America, he plundered all who were incapable of resistance, and going around Cape

Horn he steered northerly, visited and sacked Chili and Peru, and took possession of San Francisco. From that point Drake crossed to Java and the Moluccas, enriching himself at every step; and this marauding course he continued until 1580, when he returned home *via* the Cape of Good Hope. In the following year, however, his services were required for a nobler purpose than mere pillage. The Spanish Armada threatened England. To anticipate its attack, Drake, who had now been knighted by Queen Elizabeth for his voyage round the world,—the first of the kind ever made by an Englishman,—sailed to Cadiz, passed the batteries under a heavy fire, destroyed 100 ships, and inflicted the usual damage on the adjoining coasts. Making his way back, he was appointed to aid Lord Howard in repelling the Armada, and when that exploit had been performed he proceeded to the West Indies, where he died, December 27, 1595.

Drake. An early piece of brass ordnance.

Drakkar. A Norman pirate boat of former times.

Draught. A small allowance for waste on goods sold by weight. A detachment transferred from one ship to another. A drawing, made to scale, of a structure or machine.

The current of air through a furnace, which causes combustion of the fuel. Natural draught is created by a pressure due to the difference in weight of the column of heated and rarefied gases in the chimney, and that of a similar column of the surrounding atmosphere. Its intensity varies as the square root of the height of the chimney. Artificial draught is a forced current created by mechanical means, such as blowers acting beneath the fires, or by the rapid expulsion of the chimney gases by a "steam-jet."

The depth of the bottom of a vessel's keel below the surface of the water.

Draw. To pull; to attract; to procure. To procure anything on requisition or official demand. A sail *draws* when it is filled with the wind. A ship *draws* so many feet of water, according to the depth of her immersed body. *To draw upon* a ship is to gain upon a vessel in a chase. *To let draw the jib* is to cease from flattening in the sheet. *To draw off*, to move away. *To draw the guns*, to draw the charges.

Draw-net. See Drag-net.

Drayton, Percival, Captain U.S.N. Born in South Carolina, August 25, 1812; died at Washington, D. C., August 4, 1865. Son of Hon. William Drayton, M.C. Midshipman, December, 1827; lieutenant, February 28, 1838; was attached to the observatory, Washington, in 1852; commander, September 14, 1855; joined the Paraguay expedition in 1858, and from 1860 until the outbreak of the civil war was on ordnance duty at Philadelphia. Though strongly bound by family ties to the seceding States, he remained loyal to the national flag, and in the expedition to Port Royal commanded the steamer "Pocahontas"; his brother, Gen. T. F. Drayton, commanded at the same time the Confederate troops at Hilton Head Island. He was afterward transferred to the "Pawnee," and July 16, 1862, was promoted to captain, and ordered to the new Ericsson iron battery "Passaic." He was in the bombardment of Fort McAllister; in the attack on Sumter by Dupont; fleet-captain of the West Gulf Squadron, under Farragut, and was in the "Hartford" at the fight with and capture of the rebel fleet in Mobile Bay, August 5, 1864. He was particularly distinguished as Farragut's chief-of-staff. Appointed chief of the Bureau of Navigation, April 28, 1865.

Dredge. An instrument for scraping up oysters or specimens of the bottom. To fish by dragging the dredge. To remove the mud, etc., from the bottom of a harbor or channel.

Dredging Machine. A large flat-bottomed boat equipped with a steam-engine and machinery for removing mud, etc., from a harbor or channel.

Dredgy. The ghost of a person drowned.

Dreint. An old word for *drowned.*

Dress Ship. To ornament the ship by hoisting the national colors at the peak and mastheads, and setting the jack forward. When the ship is to be dressed *full*, the national flags are hoisted as before, and the signal-flags and pennants are arranged according to taste. When the signal-flags form a line from the water to the flying-jib-boom, over the mast-heads, to the end of spanker-boom and water, they are said to be arranged *rainbow-fashion.* When the ship is dressed in honor of a foreigner, person, or *fête*, the foreign national flag is given the place of honor,—the main. Aside from this, foreign flags are not used in dressing ship, as foreigners sometimes take offense if their flag is not given the prominence which they conceive to be due to it.

Drew. A name for the *Fucus lorcus*, a narrow, thong-shaped sea-weed.

Dribble. Drizzling showers; light rain.

Dries. A term opposed to *rains* on the west coast of Africa.

Drift. The deviation of a projectile from the plane of fire, due to the rifling of the gun; for a given range and calibre it depends upon the velocity of rotation as compared with that of translation, the weight and form of the projectile, and the position of its centre of gravity. The drift is *with* the rifling, and is allowed for by directing the axis of the bore sufficiently to the opposite side of the target to compensate for the deflection. Practically, this result is accomplished by a drift-piece attached to the rear sight, or by inclining the bar at a certain fixed angle to the left of the plane of fire. The angle at which the bar is set is called the "permanent drift angle."

An instrument to enlarge or clear a hole in metal. In wooden ship-building, the difference between the size of the bolt and the hole into which it is to be driven; for instance, if a bolt is made one-eighth of an inch larger than the hole into which it is to be driven, the bolt is said to have one-eighth of an inch drift; the same is applicable to a hoop which is to be driven on a mast.

The distance through which a current flows in a given time. Drift $=$ time $\times$ rate.

To be driven along on the water. To gather into heaps.

Drift-bolt. A long punch used for backing out other bolts.

Drift-ice. The débris of the main pack.

Drift-mud. Argillaceous earth brought down by streams and deposited in banks.

Drift-sail. A sail used as a drag (which see).

DRIFT-WOOD. Wood floating on the surface of the water.

Drifts. Those parts where the sheer is raised according to the heights of the decks, and where the rails are cut off and ended by scrolls.

DRIFT-PIECE. A solid piece fitted at the drifts to form the scrolls.

Drill. Practice at the various military and nautical exercises.

Drive. A ship *drives* when her anchor trips or will not hold; she drives to leeward when beyond control of sails or rudder; and if under bare poles, may drive before the wind. To strike home bolts, tree-nails, etc.

Driver. A large sail formerly used with the wind aft or quartering. It was a square-sail cut like a studding-sail, and set with a great yard on the end of the spanker-boom, across the taffrail. The name is sometimes applied to the spanker (which see). Formerly, the foremost spur on the bilge-ways, the keel of which was fayed to the foreside of the foremost poppet; it was cleated on the bilge-ways, and the sides of it stood fore and aft.

Driving Piles. The motion of a ship bobbing in a head sea, compared to the vertical fall of monkeys on pile-heads.

Drogher. A small craft in the West India Islands, to take off sugars, rum, etc., to the merchantmen. *Lumber-drogher* is a vessel built solely for burden, and for transporting cotton and other articles coastwise.

DROGHING. The carrying trade of the West India coasts.

Drogue. A drag (which see).

Droits of Admiralty (*Eng.*). Rights, or rather perquisites, which flowed originally from the king by grant or usage, and now reserved to the crown by commission. They are of two kinds, viz., the civil, or those arising from wrecks of the sea, flotsam, jetsam, and lagan, royal fishes, derelicts, and deodands, ejectamenta maris, and the goods of pirates, traitors, felons, suicides, and fugitives within the admiralty jurisdiction; and the prize droits, or those accruing in the course of war, comprehending all ships and goods taken without commission, all vessels improperly captured before hostilities have been formally declared, or found or by accident brought within the admiralty, salvage for all ships rescued, and all ships seized, in any of the ports, creeks, or roads of the United Kingdom of Great Britain and Ireland, before any declaration of war or reprisals by the sovereign.

Dromond. A Saracen term for a large man-of-war.

Droop. See HOGGED.

Drop. The depth of a square-sail; but generally applied to the courses only, *hoist* being the corresponding term for the other square-sails. *To drop* a vessel is to distance her in a race or chase. *To drop astern*, to fall behind so as to suffer another vessel to pass beyond.

Drop-dry. Water-tight.

Droud. A fish of the cod kind, frequenting the west coast of Scotland.

Drouge. A piece of board, or kind of drogue, sometimes attached to the harpoon-line, to check in some degree the speed of the whale.

Drow. An old term for a severe gust of wind accompanied with rain.

Drown. To suffocate in water. To deluge with water. Drowning was an early naval punishment. Richard I. enacted that whoever killed a man on shipboard "should be bound to the corpse and thrown into the sea."

DROWNED, DIRECT METHOD OF RESTORING THE APPARENTLY.—This method is recommended by Dr. Howard:

1. *Arouse the patient.*—Unless in danger of freezing do not move the patient an inch; but instantly expose the face to a current of fresh air; wipe dry the mouth and nostrils; rip the clothing so as to expose the chest and waist, and give two or three smarting slaps on the stomach with the open hand.

If the patient does not revive, then proceed thus:

2. *To draw off the water, etc., from the stomach and chest.*—Turn the patient on his face, a large bundle of tightly-rolled clothing being placed beneath his stomach, and press heavily over it for half a minute, or so long as fluid flows from the mouth.

3. *To produce breathing.*—Place the patient on his back, the roll of clothing being so placed as to raise the pit of the stomach above the level of any other part of the body. If there be another person present, let him, with a piece of dry cloth, hold the tip of the tongue out of one corner of the mouth, and with the other hand grasp both wrists and keep the arms forcibly stretched back above the head. (This position prevents the tongue from falling back and choking the entrance to the windpipe, and increasing the prominence of the ribs tends to enlarge the chest. It is not, however, essential to success.)

Kneel beside or astride the patient's hips, and with the balls of the thumbs resting on either side of the pit of the stomach, let the fingers fall into the grooves between the short ribs, so as to afford the best grasp of the waist. Now, using your knees as a pivot, throw all your weight forward on your hands, and at the same time squeeze the waist between them, as if you wished to force everything in the chest upwards out of the mouth. Deepen the pressure while you can count slowly one, two, three, and then *suddenly* let go with a final push, which springs you back to your first kneeling position. Remain erect on your knees while you can count one, two; then repeat the same motions as before, at a rate gradually increased from 4 or 5 to 15 times a minute, and continue thus this bellows movement with the same regularity that is observable in the natural motions of breathing, which you are imitating.

Continue thus from one to two hours, or until the patient breathes. For a while after, carefully deepen the first short gasps into full breaths, and continue the drying and rubbing, which should be unceasingly practiced from the beginning.

4. *After-treatment.*—As soon as the breathing has become established, strip the patient, warm him in blankets only, put him in a bed comfortably warm, but with a free circulation of fresh air, and leave him to perfect rest. Give a little hot brandy and water, or other stimulant, every 10 or 15 minutes during the first hour, and as often thereafter as may be deemed expedient.

DROWNED, TREATMENT OF THE APPARENTLY.—This method is recommended by the Royal National Life-Boat Institution of Great Britain:

Send immediately for medical assistance, blankets, and dry clothing, but proceed to treat the patient *instantly* on the spot, in the open air, with the face downwards, whether on shore or afloat; exposing the face, neck, and chest to the wind, except in severe weather, and removing all tight clothing from the neck and chest, especially the braces.

The points to be aimed at are,—first, the *restoration of breathing;* and, secondly, after breathing is restored, the *promotion of warmth and circulation.*

The efforts to *restore breathing* must be commenced immediately and energetically, and persevered in for one or two hours, or until a medical man has pronounced that life is extinct. Efforts to promote *warmth and circulation*, beyond removing the wet clothes and drying the skin, must not be made until the first appearance of natural breathing; for if circulation of the blood be induced before breathing has recommenced, the restoration to life will be endangered.

To clear the throat, place the patient on the floor or ground with the face downwards, and one of the arms under the forehead, in which position all fluids will more readily escape by the mouth, and the tongue itself will fall forward, leaving the entrance into the windpipe free. Assist this operation by wiping and cleansing the mouth.

If satisfactory breathing commences, use the treatment described below, to promote warmth. If there be only slight breathing, or no breathing, or if the breathing fails, then:

To excite breathing, turn the patient well and instantly on the side, supporting the head, and excite the nostrils with snuff, hartshorn, and smelling-salts, or tickle the throat with a feather, etc., if they are at hand. Rub the chest and face warm, and dash cold water, or cold and hot water alternately, on them. If there be no success, lose not a moment, but instantly:

To imitate breathing, replace the patient on the face, raising and supporting the chest well on a folded coat or other article of dress. Turn the body very gently on the side, and a little beyond, and then briskly on the face, back again, repeating these measures cautiously, efficiently, perseveringly, about fifteen times in a minute, or once every four or five seconds, occasionally varying the side.

(*By placing the patient on the chest, the weight of the body forces the air out; when turned on the side, the pressure is removed, and air enters the chest.*)

On each occasion that the body is replaced on the face, make uniform but efficient pressure, with brisk movement, on the back, between and below the shoulder-blades, or bones on each side, removing the pressure immediately before turning the body on the side.

During the whole of the operations let one person attend solely to the movements of the head and of the arm placed under it.

(*The first measure increases the expiration, the second commences inspiration.*)

Whilst the above operations are being proceeded with, dry the hands and feet, and as soon as dry clothing or blankets can be procured strip the body, and cover or gradually reclothe it, taking care not to interfere with the efforts to restore breathing.

Should these efforts not prove successful in the course of from two to five minutes, proceed to imitate breathing by Dr. Silvester's method, as follows:

Place the patient on his back on a flat surface, inclined a little upwards from the feet; raise and support the head and shoulders on a small firm cushion, or folded articles of dress placed under the shoulder-blades.

Draw forward the patient's tongue, and keep it projecting beyond the lips; an elastic band over the tongue and under the chin will answer this purpose, or a piece of string or tape may be tied round them, or by raising the lower jaw, the teeth may be made to retain the tongue in that position. Remove all tight clothing from about the neck and chest, especially the braces.

Standing at the patient's head, grasp the arms just above the elbows; draw the arms gently and steadily upwards above the head, and *keep them stretched* upwards for two seconds. (*By this means air is drawn into the lungs.*) Then turn down the patient's arms, and press them gently and firmly for two seconds against the sides of the chest. (*By this means air is pressed out of the lungs.*)

Repeat these measures alternately, deliberately, and perseveringly, about fifteen times in a minute, until a spontaneous effort to respire is perceived, immediately upon which, cease to imitate the movements of breathing, and proceed to *induce circulation and warmth.*

To promote warmth and circulation.—Commence rubbing the limbs upwards with firm, grasping pressure and energy, using handkerchiefs, flannels, etc. (*By this measure the blood is propelled along the veins towards the heart.*) The friction must be continued under the blanket or over the dry clothing. Promote the warmth of the body by the application of hot flannels, bottles or bladders of hot water, heated bricks, etc., to the pit of the stomach, the armpits, between the thighs, and to the soles of the feet.

If the patient has been carried to a house after respiration has been restored, be careful to let the air play freely about the room.

On the restoration of life, a teaspoonful of warm water should be given; and then if the power of swallowing have returned, small quantities of wine, warm brandy and water, or coffee should be administered. The patient should be kept in bed, and disposition to sleep encouraged.

General observations.—The above treatment should be persevered in for some hours, as it is an erroneous opinion that persons are irrecoverable because life does not soon make its appearance. There is an authentic account of recovery after submersion for 20 minutes.

Appearances which generally accompany death.—Breathing and the action of the heart cease entirely; the eyelids are half closed; the pupils dilate; the tongue approaches to the under edge of the lips, and the lips and nostrils are covered with a frothy mucus. Coldness and pallor increase.

Cautions.—Prevent unnecessary crowding of persons around the patient. Avoid rough usage, and do not allow the patient to remain on his back unless the tongue be secured. Under no circumstances hold the body up by the feet. On no account place the body in a warm bath unless

under medical direction, and even then it should only be done as a momentary excitant.

DROWNING PERSONS, INSTRUCTIONS FOR SAVING.

1. When you approach a drowning person in the water, assure him, in a loud voice, that he is safe.

2. Before jumping in to save him, divest yourself, as far and as quickly as possible, of all clothes; tear them off if necessary; but if there is no time, loose, at all events, the foot of your drawers if they are tied, as, if you do not do so, they will fill with water and drag you.

3. On swimming to a person in the sea, if he be struggling, do not seize him then, but keep off for a few seconds till he gets quiet, for it is sheer madness to take hold of a man when he is struggling in the water; if you do, you run a great risk.

4. Then get close to him and take fast hold of the hair of his head, turn him as quickly as possible on to his back, give him a sudden pull and this will cause him to float, then throw yourself on your back also and swim for the shore, both hands having hold of his hair, you on your back and he also on his, and of course his back to your stomach. In this way you will get sooner and safer ashore than by any other means, and you can easily thus swim with two or three persons; the writer has even, as an experiment, done it with four, and gone with them forty or fifty yards in the sea. One great advantage of this method is that it enables you to keep your head up, and also to hold the person's head up you are trying to save. It is of primary importance that you take fast hold of the hair, and throw both the person and yourself on your backs. After many experiments it is usually found preferable to all other methods. You can, in this manner, float nearly as long as you please, or until a boat or other help can be obtained.

5. It is believed there is no such thing as a *death-grasp*, at least it is very unusual to witness it. As soon as a drowning man begins to get feeble and to lose his recollection, he gradually slackens his hold until he quits it altogether. No apprehension need therefore be felt on that head when attempting to rescue a drowning person.

6. After a person has sunk to the bottom, if the water be smooth, the exact position where the body lies may be known by the air-bubbles, which will occasionally rise to the surface, allowance being of course made for the motion of the water if in a tide-way or stream, which will have carried the bubbles out of a perpendicular course in rising to the surface. A body may be often regained from the bottom before too late for recovery by diving for it in the direction indicated by these bubbles.

7. On rescuing a person by diving to the bottom, the hair of the head should be seized by one hand only, and the other used in conjunction with the feet in raising yourself and drowning person to the surface.

8. If in the sea, it may sometimes be a great error to try and get to land. If there be a strong outsetting tide, and you are swimming either by yourself, or having hold of a person who cannot swim, then get on your back and float till help comes.

9. These instructions apply alike to all circumstances, whether the roughest sea or smooth water.

DROWNING THE MILLER. Adding too much water to wine or spirits.

Drub. To beat.

Drugger. A small vessel which formerly exported fish from Dieppe and other Channel ports, and brought back from the Levant spices and drugs.

Drum-fish. A genus of fishes (*Pogonias*) which make a peculiar drumming or grunting noise under water.

Drum-head. That portion of a capstan in which the bars are inserted.

Drumler. An ancient transport. (See DROMOND.) Also, a small piratical vessel of war.

Drummer. The marine who beats the drum. Also, a singular fish of the corvinas kind, which has the faculty of emitting musical noises, whence it has acquired the name of *crocros*.

Druxy. Timber in a state of decay, the condition of which is manifested by veins or spots of a whitish tint.

Dry-bulb Thermometer. The readings of this instrument, when compared with those of a wet-bulb thermometer, indicate the amount of moisture in the air.

Dry-dock. An artificial receptacle for examining and repairing vessels. See DOCKS.

Dry-ducking. Suspending a person by a rope above the surface of the water.

Dry-flogging. Punishing over the clothes of a culprit.

Dry-gales. Those storms which are accompanied with a clear sky, as the *northers* of the Gulf of Mexico, the *harmattan* of Africa, etc.

Dry Holy-stoning. See HOLY-STONE.

Dry-pipe. A prolongation or system of branches of the main steam-pipe, extending within a steam-boiler at the highest point possible, by which the steam is drawn through numerous small holes or narrow slits in its upper side equally from all parts of the boiler. Its object is to prevent priming and collect the steam in a dry state.

Dry-rot. This is the result of the growth of a parasitic fungus (*Polyporus hybridus** and other species of *Polyporus*) within the substance of wood, whereby it loses its elasticity and firmness, becomes brittle, and finally crumbles into dust. This result follows from the nutrition of the plant, which withdraws from the wood portions of its carbon and nitrogen, and so alters its composition. The fungus consists mainly of minute branching white threads (*mycelium*), which penetrate between the fibres of the wood, and are nourished at their expense. It may extend to all parts of a ship without producing fruit (spores), undermining the interior parts of timber, but avoiding the light and air, under cover of a thin shell of sound wood which conceals its ravages. It flourishes in dark, damp, and confined places, such as the frame-spaces of ships, and the inner parts of the planking which covers them. When the *Polyporus* fruits (which is seldom) it seeks the light and develops its spore-bearing organ (*pileus*), resembling a crust of dried white paint at the surface. On the external side of this crust are innumerable

* Nat. Ord. *Hymenomycetæ*, Fam. *Polyporei*.

minute pores, within which the spores are to be found, growing in fours on the summits of slender stalks (*basidia*), easily visible under a magnifying power of about 200 diameters. The mycelium may, however, be detected with the naked eye as white threads lying between the bundles of woody fibre and parallel with them. Under the microscope, the mycelium is seen to consist of very minute branching filaments, matted or felted together.

Since the dry-rot fungus flourishes only under the conditions of moisture, darkness, and confined air, its growth may probably be prevented on shipboard by such a system of construction as shall afford free ventilation of the bilges, frame-spaces (by boring through filling-chocks and by openings on the spar-deck), spaces beneath store-room floors, and recesses behind bulkheads; by forced ventilation, as now practiced in the U. S. S. "Richmond"; and by keeping the holds and lower decks dry. Extensive experiments are now (1880) being prosecuted by the Navy Department with a view to the preservation of ship-timber from decay, by impregnation under pressure with carbolic acid ("Burnettizing"), and with barium sulphate (the "Thilmany process"), from which good results are hoped for.

Besides the pecuniary loss resulting from the ravages of dry-rot, it appears to afford a peculiarly favorable nidus for the development of the yellow fever poison, and the preservation of its vitality against the unfavorable influence of cold weather. See YELLOW FEVER.

Other fungi, such as a cobweb-like growth on the under side of wet planks (*Helminthosporium*), molds, and patches of surface discoloration, are common on shipboard, but do not appreciably influence the decay of wood.—*J. H. Kidder, Surgeon U.S.N.*

Dub. A term for a pool of deep smooth water in a rapid river.

Dubb. To cut off and smooth with an adze the superfluous wood. *To dubb a vessel bright*, is to remove the outer surface of the plank completely with an adze. Spotting with the adze to examine planks is also dubbing.

Dubbah, or Dubber. A coarse leathern vessel for holding liquids in India.

Dubhe. A standard nautical star in the Great Bear, *α Ursæ Majoris.*

Dublin. The capital city of Ireland, on the Liffey, close to its entrance into Dublin Bay, Irish Sea, 66 miles W. of Holyhead, and 135 miles W. of Liverpool. Lat. 53° 23′ 2″ N.; lon. 6° 20′ 5″ W. The harbor has been latterly much improved, and near the mouth of the Liffey are the Grand Canal and the custom-house docks, the latter occupying 8 acres; depth at low water 12 feet, at high tides 24 feet. The bay is noble and picturesque, and esteemed one of the finest in the United Kingdom; it is about 7 miles in breadth at its entrance, between Howth Head, on the north, and Kingston, on the south. Pop. 246,300.

Ducat. A well-known coin in most parts of Europe. See MONEY.

Ducatoon. A coin of the Dutch Oriental Isles, value about $1.70. Also, a silver coin of Venice, value about $1.10.

Duck. To dive, or immerse another under water. The finest canvas for small sails is sometimes called *duck;* but it is really a lighter cloth than canvas, and is much used by seamen and soldiers in hot climates for frocks and trousers.

DUCKING. A penalty which veteran sailors inflict on those who, for the first time, pass the tropics, the equator, or formerly even the Strait of Gibraltar, and usually performed in a tub or half-butt, with the assistance of a few buckets of water; the usual fine, however, generally prevents the penalty being inflicted.

DUCKING AT THE YARD-ARM. A marine punishment formerly inflicted by the French for grave offenses; the criminal was placed astride a short thick batten, fastened to the end of a rope which passed through a block at the yard-arm. Thus fixed he was hoisted suddenly up to the yard, and the rope being then let go he was plunged into the sea. This operation was repeated several times, conformable to the sentence; a gun advertised the other ships of the fleet that their crews might become spectators. If the offense was very great he was drawn underneath the keel of the ship, which was called keel-hauling. See KEEL-HAULING.

DUCKS. The general name for a sailor's dress in warm climates.

Duck Up. To raise the clew of the mainsail or foresail when it interferes with the steering by shutting out the landmarks.

Dudgeon Wrath. An old word for the box-handle of a dirk.

Duds. A cant term for clothes or personal property. The term is old, but still in common use, though usually applied to clothing of an inferior quality.

Duel. In former days duels were of frequent occurrence in the navy, but latterly they are almost unknown. It is forbidden by the regulations to send or accept a challenge to fight a duel or act as second in a duel, and courts-martial are empowered to inflict any punishment for this offense, except death, flogging, or imprisonment at hard labor.

Duff. A sort of pudding. The posterior.

Duffer. A low peddler. A woman who assists smugglers. A stupid or cowardly fellow.

Dugong. An herbivorous mammal of the East Indian seas, intermediate between the *Cetacea* and the *Pachydermata*, having an elongated body, with flippers near the head, and terminated by a crescent-shaped tail.

Dug-out. A canoe hewn from one tree.

Duguay-Trouin, René, one of the most illustrious of French sailors, was born at Saint Malo, 10th of June, 1673, and died at Paris, 27th of September, 1736.

He came from a family of sailors, but was himself destined from childhood to be an ecclesiastic, going early to the College of Rennes, where he donned the soutane, and received the tonsure, with a view to succeeding to a rich benefice which friends of his family had in their gift.

His father died when he was only fifteen, and he was then sent to Caen to study philosophy. Here his sanguine temperament and love of pleasure caused him to break bounds, and he neglected his studies for the dissipations of a large city. His escapades at last became quite notorious, and he was forced by his family to return to Saint Malo, whence he was soon sent to sea in the *corsaire* "La Trinité," in which his

family had a large interest. This was in 1689. He remained in this vessel for two years, undergoing considerable hardship, but always distinguished for his conduct in numerous engagements with English and Dutch vessels.

After this apprenticeship, he went to sea in another vessel, of 18 guns, when he showed so much courage and conduct that he was given a command, being then only 18 years of age. After this he continually distinguished himself by attacks upon the English shipping, both in privateers and in vessels of the state. In 1694, while in command of the "Diligente," a 40-gun frigate, he was surrounded by an English squadron of six men-of-war, under Admiral Sir David Mitchell. After fighting for twelve hours, his crew were nearly all killed or wounded, he himself was wounded, and his ship on the point of sinking, so he was obliged to surrender. He was imprisoned at Plymouth, where he managed to make a friend of a pretty bumboat woman, and with her assistance escaped in a small boat, with his lieutenant, his surgeon, the boatswain, and a servant. After forty-eight hours of very rough weather they managed to reach the coast of Brittany.

He was soon at sea again, in a ship of 48 guns, in which he took two English men-of-war of superior force, one of which he brought in. For this action he received a sword of honor, and was invited to join the fleet of the Marquis de Nesmond, where he had his usual success in making prizes.

After this cruise he went to Paris, to be presented to Louis Quatorze, and received many honors while there. He did not remain long, however, returning to his sea-life, and had command of several small squadrons, which he handled with his accustomed ability, having been made *capitaine de frégate* of the royal marine.

After the peace of Ryswick he passed four years of enforced idleness; but upon the breaking out of the war of the Spanish succession, he was again promptly at sea, serving against the Hollanders and the English, in which he passed through many battles and many perils. In 1705, when thirty-two years of age, he was made *capitaine de vaisseau*, and very shortly after, in consequence of continued successes against the Portuguese, English, and others, he, with his elder brother (two younger ones had been killed while serving under him), received letters of nobility.

In 1711 he sailed, in command of a fleet of 7 line-of-battle ships, 8 frigates, and 2 bomb-vessels, with nearly 6000 men, for Rio de Janeiro. He entered the bay under the fire of the Portuguese batteries, and the next day disembarked his force. After some slight resistance the city was abandoned by its inhabitants. Duguay-Trouin then threatened to utterly destroy the place unless a handsome ransom was paid. This was done, and he then set out on his return to Brest, but lost two of his largest vessels on the voyage,—sunk in a hurricane. For this action he received a pension of 2000 crowns and the title of commandant of the marine of Saint Malo; and in 1715, at Versailles, he received the commission of admiral of the fleet.

Louis XIV. died soon after this, and Duguay-Trouin remained at Saint Malo in retirement until 1723, when, under the regency, he was made a councillor for India. In 1728 he was made commander of the order of St. Louis and lieutenant-general. The next year he was made commandant of marine of Brest and of the coasts of Brittany. In 1731 he commanded a fleet fitted out to punish the Barbary corsairs, but the appearance of the force so imposed upon the Moors that they gave every satisfaction without any fighting. Although he continued in service, this was his last active employment. His labors and exposure had undermined a naturally vigorous constitution, and he died in Paris at 63 years of age.

Duguay-Trouin was so disinterested and generous that, in spite of his many captures, he died comparatively poor. His officers and sailors fairly worshiped him, not only on account of his intrepidity, but because of his liberality in regard to prize-money. A statue of him is erected in the "Place Duguay-Trouin," at Saint Malo.

A portrait of this intrepid sailor is in the city hall, and in the museum at Versailles is a statue of him in black marble. The portrait represents him in a rich military costume, decorated with the order of the Holy Ghost. On his bandolier are the arms granted him by Louis XIV.,—two fleur-de-lis and an anchor. He holds a pistol in his right hand, while the left grasps the hilt of his sword. His hat is ornamented with plumes, which, in our day, is not considered naval. There is also a statue of Duguay-Trouin in the Bourse, at Nantes, and there are two other well-known oil-paintings of him. He is represented with a youthful and animated countenance, wears a huge wig, and a coat above his cuirass.

His arms appear upon the picture (given by Louis XIV.),—the fleur-de-lis and anchor,—and the legend, "Didit hæc insignia virtus."—*E. Shippen.*

Duke of York (*Eng.*). A nickname for a peculiar storm-trysail used in the northern seas.

Dulce, Dulse, Delse. One of the edible fuci, *Iridea dulce.* It is plentiful on the rocky coasts of Ireland and western England. It probably derived its name from being sweet and pleasant, not requiring cooking.

Duledge Plate. An old name for the tire or iron plate on the circumference of the wheel of a field-piece. Duledge was also used for dowel, the wooden pin connecting the felloes.

Dull'd. Fallen or moderated; said of the wind.

Duluth. A city and port of entry of Minnesota, the capital of St. Louis Co., is finely situated at the W. end of Lake Superior, and is the eastern terminus of the Northern Pacific Railroad. Lat. 46° 48′ N.; lon. 92° 6′ W. Duluth has a very advantageous position for a commercial city, being at the head of navigation on the great lakes. Pop. 3300.

Dumb-chalder. A metal cleat bolted to the back of the stern-post for one of the pintles to rest upon, to lessen both strain and friction.

Dumb-craft. Lighters, lumps, or punts, not having sails. A name for the screws used for lifting a ship on the slip.

Dumb-pintle. A peculiar rudder-strap.

Dumb-scraping. Scraping wet decks with blunt scrapers.

Dumb-sheave. An aperture without a sheave, through which is rove a rope.

Dumfounder. To confuse or perplex.

Dummy. A wood frame landing-place in front of a pier.

Dump-bolt. A short bolt, not driven through two pieces of timber; sometimes called a *blunt-bolt.* Also, in wooden ship-building, a fictitious bolt, sometimes driven into knees,—merely a short piece of iron with a head on it to make the fastenings appear regular.

Dumps. Nearly synonymous with *down in the mouth.*

Dunbar Medlar. A salted herring.

Duncan, Admiral (Lord Camperdown). Born in 1731, at Dundee, Scotland; entered the navy as midshipman in 1746; became lieutenant in 1755, and in 1761 commander of the "Valiant," of 74 guns; in 1789 appointed rear-admiral of the blue, and in 1793 vice-admiral of the blue.

Although this truly good and gallant man saw much service under Admiral Keppel and Lord Howe in Africa, America, and the Mediterranean, it was not until he obtained independent command in the North Sea that he had a chance of distinguishing himself. By the exercise of patience, constancy, and cool courage he was enabled to draw an immense Dutch fleet out of the Texel, and after a long and severe encounter, in October, 1797, to completely beat his enemy and capture nine large line-of-battle ships (including that of the famous De Wister) and two frigates. For a victory so acceptable to the nation Duncan was created a viscount, with a pension of £2000 a year, and his title (Lord Camperdown) was derived from the locality of the fight. Died August 4, 1804.

Dunderhead. A term used for a stupid fellow.

Dun-diver. A name for the goosander (*Mergus merganser*) in immature plumage.

Dundonald, Earl. Born December 14, 1775. While still a boy obtained a commission in the 104th Regiment. At the age of 17, however, he joined the "Hind" corvette, commanded by his uncle, Capt. Sir Alexander Cochrane, and began the career in which he was destined to win so much renown.

In April, 1809, a French fleet having assembled in Basque Roads for the purpose of protecting Martinique, then threatened by an English force, Admiral Gambier was deputed to blockade the French in the roads. In this enterprise he was assisted by Lord Cochrane, afterwards Earl of Dundonald, an officer of singular intrepidity. To prevent the ingress of the British ships of war the French admiral caused a barrier to be constructed of booms and spars lashed together and anchored at either end. With twelve fire-ships Lord Cochrane dashed through the obstruction and advanced towards the fleet of the enemy. Those of the French fleet that escaped being burnt or blown up were run ashore by the French admiral. Thus was the purpose of the French utterly frustrated. Commander-in-chief on the North American and West India Station. In 1851 he was vice-admiral of the white, and in 1854 rear-admiral of the United Kingdom, a distinction which he held to his death. He died October 31, 1860.

Dunes. An Anglo-Saxon word still in use, signifying mounds or ridges of drifted sands. See Downs.

Dun-fish. A peculiar preparation of cod, by which it retains a dun or dark yellow color.

Dungaree. A kind of blue cotton stuff used for working-clothes by the cooks, and for facings for collars and cuffs. At present the regulations require that the cuffs and collars shall be of blue flannel.

Dungaree-duck. A name given to a small dried fish in Bombay.

Dungiyah. A broad-beamed flat-bottomed Arabian coaster trading between the Red Sea, Gulf of Persia, and the Malabar coast.

Dunkirk. A fortified seaport town, and the northernmost of France, department of Nord, on the Strait of Dover, 40 miles N.W. of Lille, and 45 miles E. of Dover, at the junction of three canals and of several railways. It has a heavy trade and important fishery. It has two harbors, with extensive docks, a breakwater, and other artificial improvements. Pop. 35,100.

Dunkirks. The well-known name for pirates who sailed out of Dunkirk.

Dunlin. The name of a species of sandpiper (*Tringa cinclus*).

Dunn, Edward T., Paymaster-General U.S.N. Born in District of Columbia. Appointed from District of Columbia, February 21, 1831; attached to sloop "John Adams," Mediterranean Squadron, 1833–34; schooner "Boxer," Pacific Squadron, 1835; sloop "Vincennes," Pacific Squadron, 1836; frigate "Macedonian," West India Squadron, 1837–40; receiving-ship, Norfolk, 1845; frigate "Columbus," East India Squadron, 1846, and in the Pacific Squadron during the Mexican war; navy-yard, New York, 1850–51; frigate "Columbia," Home Squadron, 1852–55; navy-yard, Norfolk, 1857–60; sloop "St. Mary's," Pacific Squadron, 1861–63; Fleet-paymaster, West Gulf Blockading Squadron, 1863–65; paymaster at Baltimore, 1866–69; chief of Bureau of Provisions and Clothing, 1870–73. Commissioned as paymaster-general in 1871; placed on retired list in January, 1873; detached from the bureau in February, 1873, and ordered on special duty to Naval Station, New Orleans, and navy-yards at Pensacola and Mare Island; returned to Washington in August, 1873; retired, having attained the age of 62, in 1874.

Dunnage. Loose wood or other substances, as horns, rattan, coir, etc., to stow among casks and other cargo to prevent their motion. See Stowage.

Dunnage Battens. An extra floor in a merchantman to preserve the cargo from wet in the event of leakage.

Dunnage-gratings. Gratings on which cargo is stowed.

Dunter. A name for the porpoise.

Dupont, Samuel Francis, Rear-Admiral U.S.N. Born at Bergen Point, N. J., September 27, 1803; died in Philadelphia, June 23, 1865; grandson of P. S. Dupont Nemours. Midshipman in the navy at 12; lieutenant, April 26, 1826; commander, October 28, 1842. In 1845 he was ordered to the Pacific in command of the frigate "Congress," and during the Mexican war saw much active service on the Californian coast. In the "Cyane," he captured San Diego; cleared the Gulf of California of Mexican vessels; took La Paz, the capital of Lower California; assisted in the capture of Mazatlan in November, 1847, and defended Lower California against the Indians and Mexicans. In Feb-

ruary, 1848, he landed at San José with a hundred marines and sailors and defeated and dispersed a Mexican force five times as great. Captain, September 14, 1855. Having recommended the occupation of Port Royal as a central harbor or depot on the southern coast, he was given the command of the South Atlantic Blockading Squadron, and intrusted with the attack on that place. Sailing from Fortress Monroe, October 29, 1861, in the "Wabash," with a fleet of 50 sail of war vessels and transports, conveying Gen. Sherman's troops, he arrived off Port Royal November 4 and 5, after a violent storm, and on the 7th attacked and captured two strong forts on Hilton Head and Bay Point, which defended the harbor. He followed up this advantage vigorously, and his operations along the southern coast were invariably successful. He also succeeded in making the blockade more effective than before. July 16, 1862, he was made a rear-admiral on the active list. In April, 1863, he commanded the fleet which unsuccessfully attacked Charleston. He was soon after relieved of the command of the South Atlantic Blockading Squadron, and subsequently held no active command. Admiral Dupont aided in organizing the naval school at Annapolis, and is the author of a report on the use of floating-batteries for coast defense, which has been republished and highly commended in England by Sir Howard Douglas in his work on naval gunnery.

Duquesne, Abraham, Marquis, lieutenant-general of the sea forces, and one of the greatest seamen France ever produced, was born at Dieppe in 1610. Entering the navy early, he soon rose to the command of a small vessel, in which he joined in the recapture of some of the French islands from the Spaniards, for which service he was reported most favorably to Richelieu. During the operations he learned of the death of his father, in action with the Spaniards, and Duquesne seems to have ever after entertained the most lively dislike for that nation, causing them to feel the effects of his resentment on numberless occasions. In 1638 he, under circumstances of great difficulty and peril, rescued from under the guns of St. Sebastian several French vessels which had been stranded there. The same year, at the battle of Gattari, Duquesne decided the victory by blowing up the Spanish admiral's flag-ship by means of a fire-vessel.

In 1639 he served in the naval operations on the Biscayan coast, and at the capture of Laredo and Santona. At the latter place he was dangerously wounded by a bullet in the jaw while boarding a galleon.

During 1641 he served in the Mediterranean against the Spaniards, was constantly engaged, and again wounded. Two years afterwards he was again actively engaged on the coast of Spain, participating in the battles off Cape de Gatte (where he was again wounded) and at Carthagena.

Richelieu having died, the French navy fell into neglect, and Duquesne took temporary service under the Swedish crown, which was then engaged in a naval warfare with Denmark. Queen Christina received him very cordially, giving him at first the rank of major-general, and afterwards that of vice-admiral.

In the latter capacity he bore a part in the naval engagement of 1644, under Nicolas Flemming and Torstensen, against the old king Christian IV. of Denmark. He also served in the naval battle off the island of Fremeren, under the command of Admiral Wrangel, the Danish fleet being commanded by Admiral Prosmond.

Peace between Sweden and Denmark being shortly after this concluded, Duquesne retired from the Swedish service and returned to France. In 1645 he was again actively employed against Spain, and in the following year was once more wounded, in a naval battle upon the coast of Italy.

In 1647, being then a *capitaine de vaisseau*, he was sent to Sweden to purchase four vessels of the line for the French navy, after which he assumed command of the squadron of Dunkirk, in French Flanders, which position he retained for five years.

In 1653 occurred the naval operations of the Duke de Vendôme about the mouth of the Gironde, consequent upon the civil war of the Fronde. The French navy had by this time so decreased that the duke, in summoning Duquesne from the North Sea to his assistance, was obliged to ask the latter to man and equip some of the vessels at his own expense. On his way down the channel to join the duke, Duquesne met an English squadron, which summoned him to strike his flag,—a token of submission at that time imposed upon all foreigners by the English, if within Ushant or even Finisterre. To the demand Duquesne returned a haughty refusal, whereupon a very close and murderous engagement took place, which resulted in the English (although quite equal in guns to the French) being put to flight. On arriving off the Gironde a Spanish squadron, operating in connection with the insurgents, attempted to bar his progress; but he drove them off and succeeded in joining the Duke de Vendôme, and greatly assisted in the reduction of Bordeaux and all Guyenne.

In recognition of his services Anne of Austria bestowed upon Duquesne a chateau and estate in Brittany, with a promise of further reimbursement for his expenses in fitting out his squadron. The peace of the Pyrenees, signed in 1659, for a time relegated Duquesne to civil life. But Colbert, during this cessation of arms, had the wisdom to imitate Richelieu in fostering and rebuilding the navy of France, so that when war broke out, in 1672, between France and Holland, the former was able to at once send to sea a formidable fleet.

During this same year Duquesne took part, with a high command, in the great naval battles which took place in the North Sea; particularly those off Southwood, where Vice-Admiral d'Estrées was opposed to the Dutch Admiral Benkaërt, and the two battles where the combined French and English fleets, under Prince Rupert, Admiral Spragg, and D'Estrées, fought the Hollanders under Ruyter, Cornelis Tromp, and Benkaërt.

England suddenly made peace with Holland, but France continued the war, with the alliance of Spain, Germany, and the Two Sicilies. An insurrection occurring in Sicily, Louis XIV. resolved to sustain the revolutionists, and Du-

quesne, who was by this time lieutenant-general of the naval forces of France, sailed from Toulon, in January, 1675, in command of a strong fleet, destined for Sicily.

In sight of the coast of that island he was attacked by a Spanish fleet much his superior in force, which he not only succeeded in repelling, but actually drove his opponents to take refuge at Naples, and successfully conducted to a safe harbor in Messina a large convoy, with provisions and munitions of war.

He soon returned to France for provisions and stores, so necessary to the French in their operations in Sicily, and while at Toulon, preparing to return, learned that the celebrated Admiral de Ruyter had entered the Mediterranean, with the purpose of operating in conjunction with the Spaniards, and soon after received orders to take command of a strong fleet and to go to meet the great Dutch admiral.

Duquesne was now about 64 years of age. He sailed in December, 1675, with a fleet of 20 ships of the line and 6 fire-ships, direct for Messina. Ruyter no sooner learned that he was at sea than he used all means to encounter him, giving out that his purpose was to fight and conquer the brave Duquesne. *Par nobile fratrum.*

The opposing fleets met off the Lipari Islands, on the 7th of January, 1676, and passed the entire day in manœuvring, and the succeeding night in working for the weather-gage.

Next morning Duquesne found himself to windward, and bore down to engage Ruyter. The French fleet was in three divisions, the centre commanded by Duquesne, in the "Saint Esprit." The Dutch fleet was also in three divisions, and consisted of 24 sail of the line, 2 ships armed *en flûte*, and 4 fire-ships.

The French fleet came down in perfect order, and the battle opened at 9 A.M., the engagement soon becoming general. It was stubbornly contested, and lasted, with varying fortunes, for four hours and a half, the result being that the Dutch fleet, which had intended to bar Duquesne's passage, was so handled that the French admiral was able to anchor in Messina on the next day. During this action the two flag-ships exchanged many broadsides, in which encounters the Dutch had rather the advantage.

Both fleets having been refitted and reinforced, they met again on April 22, 1676; Duquesne having 30 ships of the line and 8 fire-ships, and Ruyter 29 ships of the line, 9 galleys, and 4 fire-ships.

When the action became general the admirals' ships engaged each other, and Ruyter was wounded in several places. After a tremendous battle the Dutch vice-admiral, De Haan, drew off his forces at sunset, and took refuge in the close port of Syracuse, Duquesne keeping the sea on the site of the battle, with his battle-lanterns burning. Next day he appeared off Syracuse, but without being able to draw out his opponents.

Ruyter died of his wounds within a few days, and the whole operation was a great victory for Duquesne. On May 26 of the same year the French fleet attacked the allied fleet in the Bay of Palermo, and the fire-ships of Duquesne blew up twelve Dutch and Spanish vessels, and with them Admiral De Haan, Admiral Don Diego Ibarra, and others; the French loss being comparatively small.

Upon his return from this action Duquesne met the "Concordia," which ship was carrying back to Holland the remains of the illustrious De Ruyter. Giving her free passage, he saluted the remains in an appropriate manner. Louis XIV. ordered all the forts and batteries in sight of which the Dutch vessel bearing his remains passed to salute. See Ruyter.

When it came to recompensing Duquesne for all his long and arduous and distinguished services, Louis XIV. required him to renounce the Protestant faith, promising him a marshal's baton and other honors. Duquesne simply replied that if he was a Protestant his services were Catholic. He received the domain of Du Bouchet, and was made marquis by letters dated February, 1681.

He continued to serve at sea, though now an old man. Among other exploits of this date, he burned some Spanish vessels in the harbor of Barcelona.

After the peace of Nimeguen he kept very quiet, and seldom went to court,—an unusual thing in those days, especially for those who had claims to distinction.

In 1682 he was sent with a fleet against the Moors of Algiers, which city he bombarded for several days with great effect, but was forced by the weather to return and winter at Toulon. In June, 1683, he appeared before Algiers again, completely reducing the place, so that the population rose against the dey. The French slaves were given up, but Mezzo Morto, who had succeeded to the dey slain by the insurgents, renewed the defense, when the bombardment was continued by Duquesne to an extent which rendered the Algerines harmless for a long time, by destroying all their vessels and naval stores.

Two years afterwards—1684—Duquesne commanded the French fleet which bombarded Genoa, and, at different times, inflicted so much damage as to oblige the doge and four senators to come to Versailles, to beg pardon, in person, from the king. It was on this occasion that the doge was asked what he found most surprising in Versailles, and answered "that it was to find himself there." The Genoese expedition was Duquesne's last service. He had served sixty years. The revocation of the Edict of Nantes distressed the veteran seaman beyond measure. He alone of all the Protestants of France was excepted from proscription, and retained his rank and honors, but his children and friends, his relatives and co-religionists, were banished, and this had a most depressing effect upon the veteran admiral, and, no doubt, hastened his death.

He died at Paris on February 2, 1688, aged 78 years. By his last words he implored his eldest son not to serve against his country, as many of the exiled Huguenots were then doing. So great was the feeling at the time of his death that his remains were privately buried, his son's request to have them sent to him, in Switzerland, being refused; but he erected a tablet to his memory. This was a great contrast to the splendid obsequies and tomb given by Holland to his adversary, Ruyter.

Louis XVI. afterwards made some reparation for this treatment of a great French naval hero, by placing Duquesne's portrait in the royal apartments at Versailles, and in 1844 the city of Dieppe erected a bronze statue in his honor.

One of the large vessels of the French navy is generally called "Duquesne."—*E. Shippen.*

Dur-mast. An inferior kind of oak of rapid growth.

Dust. Broken particles of hard bread.

Dutch. The people of Holland. The language spoken in Holland; hence any gibberish or language which Jack does not understand.

DUTCH-CAPER. A light-armed vessel of the 17th century, adapted for privateering, and much used by the Dutch.

DUTCH CONSOLATION. Negative consolation.

DUTCH COURAGE. The excitement inspired by drinking spirits; false energy.

DUTCH EEL-SKUYT. A flat-bottomed cutter-rigged sea-boat, carrying lee-boards, fitted with two water-tight bulkheads, making a well for keeping live fish in, the water being admitted through perforated plates fastened on inside the ribs.

DUTCHIFYING. A term used for converting square sterns to round ones.

DUTCHMAN'S BREECHES. The patch of blue sky often seen when a gale is breaking is said to be, however small, "enough to make a pair of breeches for a Dutchman." Others assign the habiliment to a Welshman, but give no authority for the assumption.

DUTCH PLAICE. The *Pleuronectes platessa.* When small, it is called fleak; when large, Dutch plaice.

DUTCH PUMP. A punishment so contrived that, if the prisoner would not pump hard, he was drowned.

DUTCH RECKONING. A bad day's work, all in the wrong.

DUTCH REDS. High-smoked herrings prepared in Holland.

Duttees. Coarse brown calicoes of India.

Duty. The exercise of those functions which belong to the service, and are carried out from the highest to the lowest. See CUSTOMS.

D-valve. A slide-valve provided with semi-cylindrical ends around which steam-tight packing is placed, thus relieving the valve-faces and valve-seat of the steam-pressure to which the unbalanced plain slide-valve is subjected. The friction of the packing, however, when insuring a steam-tight joint, is about equal to that due to the steam-pressure, and the device is now obsolete. It was formerly in extensive use in British steam-engines.

Dyce, or Thyst. See DICE.

Dyelle. A kind of mud-drag used for cleaning rivers.

Dying Man's Dinner. A snatch of refreshment when the ship is in extreme danger.

Dyke. From the Anglo-Saxon *dic*, a mound or bank.

Dyke-cam. A ditch-bank.

Dynamite. See EXPLOSIVES.

Dynamometer. An instrument for measuring force or power, especially that of animals or machines.

E.

Eager, or Eagre. The whole of the flood-tide moving up a river in one tidal wave, or in two or three successive waves. The name seems to be derived from the Anglo-Saxon *eágor*, water, or *Ægir*, the Scandinavian god of the sea. See BORE.

Eagle, Henry, Commodore U.S.N. Born in New York. Appointed midshipman from that State, January 1, 1818.

Commissioned as lieutenant, March 3, 1827; in sloop "Natchez," West Indies, 1827; frigate "Hudson," Brazil, 1829–31; receiving-ship, at New York, 1833–34; sloop "Erie," Brazil, 1835–37; rendezvous, New York, 1840; sloop "Yorktown," Pacific, 1841–42; commanding schooner "Shark," Pacific, 1843–44.

Commissioned as commander, June 4, 1844; superintended the construction of Stevens's iron ship, Hoboken, N. J., for three years, to 1846; inspector, etc., at New York, 1846; commanding bomb-vessel "Ætna," and a division of the squadron of five vessels during the Mexican war; stationed at Tabasco, also civil and military governor of the province, and collector of the port, 1847–48; special service, 1851; commanding steamer "Princeton," Home Squadron, 1854–55.

Commissioned as captain, September 14, 1855; volunteered for the command of gunboat "Monticello," in April, 1861, and was in command of her during the attack on Sewell's Point Battery, Virginia, May 19, 1861; commanding frigate "Santee," Gulf Squadron, 1861–62. The boats of the "Santee" captured the privateer "Royal Yacht," Galveston harbor.

Commissioned as commodore, July 16, 1862; prize commissioner, New York, 1864–65; light-house inspector, 1865–66. Retired January 1, 1863.

Eagle. The standard of the eagle was first borne by the Persians; and the Romans carried figures of the eagle, as ensigns, in silver and gold, and sometimes represented with a thunderbolt in its talons, on the point of a spear; they adopted the eagle in the consulate of Marius, 102 B.C. When Charlemagne became master of the whole of the German empire, he added the second head to the eagle for his arms, to denote that the empires of Rome and Germany were united in him, A.D. 802. The eagle was the imperial standard of Napoleon; and is that of Austria, Russia, and Prussia. It is also the national emblem of the United States of America.

A gold coin of the value of $10. See SPREAD-EAGLE.

Eagle-ray. A large species of ray-fish (*Myilobatis aquila*); called also *miller*.

Ear. A lug cast on old projectiles of great

weight, for convenience in handling. *Ears of a boat*, an old term for the knee-pieces at the bow on the outside at the gunwale height.

Earing. A small line used to fasten the upper corners of a sail to the yard or gaff, or the corners of an awning to the rigging or stanchions. Those at the upper corners of a square-sail are called *head-earings* to distinguish them from the *reef-earings*.

EARING, BULL-. An earing to haul out the edge of an awning. An earing composed of two ropes spliced into each other and marled together, forming an eye, which goes over the topsail yard-arm; used for the first and second reefs.

EARING-CRINGLE. The cringle through which an earing is passed.

EARING, HEAD-. See EARING.

EARING, REEF-. See REEF-EARING.

Earne, or Erne. The sea-eagle.

Earth. The globe which we inhabit. It is the third planet in order from the sun, and the largest within the belt of the planetoids. It is in form an oblate spheroid, the equatorial diameter being 7925.6 miles, and the polar 7899.1 miles,—the polar compression being about $\frac{1}{300}$ of the diameter. The surface of the earth contains nearly 150,000,000 square miles. The earth moves around the sun in an ellipse, the journey being performed in about 365¼ days. The least distance of the earth from the sun is over 94,000,000 miles, and the greatest is over 96,000,000, the mean distance being about 95,000,000. The velocity of the earth in its orbit is about 19 miles per second. The earth has also a daily motion on its axis, the velocity increasing from the pole, being about 1440 feet per second at the equator.

The globular form of the earth, the five zones, some of the principal circles of the sphere, the opacity of the moon, and the true cause of lunar eclipses, were taught, and an eclipse predicted, by Thales of Miletus, about 640 B.C. Its magnitude was calculated from measuring an arc of the meridian by Eratosthenes, 240 B.C. The Greeks taught the sphericity of the earth, and the popes believed it to be a plane, and gave all towards the west to the kings of Spain. Pythagoras demonstrated from the varying altitudes of the stars by change of place, that the earth must be round; that there might be antipodes on the opposite part of the globe; that Venus was the morning and evening star; that the universe consisted of twelve spheres,—the sphere of the earth, the sphere of the water, the sphere of the air, the sphere of fire, the spheres of the moon, the sun, Venus, Mercury, Mars, Jupiter, Saturn, and the sphere of the stars, about 506 B.C. Aristarchus, of Samos, maintained that the earth turned on its own axis, and revolved about the sun; which doctrine was held by his contemporaries as so absurd, that the philosopher had nearly lost his life to his theory, 280 B.C.

The notion of its magnetism was started by Gilbert in 1576. The experiments of M. Richer, in 1672, led Newton to prove the earth to be in the shape of an oblate spheroid. The variation of its axis was discovered by Dr. Bradley in 1737. The first voyage round the globe was performed by Picaro, commanding a ship of Magellan's squadron, 1520–24. The first English navigator who performed the same enterprise was Sir Francis Drake, 1577.

Ease. *To ease away* or *to ease off* is to slack off a rope carefully. *To ease the helm* is to put the helm more nearly amidships, to lessen its effect on the ship, or to lessen the strain on the wheel rope. *Ease her*, applied to the engine, means to reduce the speed.

East (Ang.-Sax. *y'st*). The cardinal point in that part of the horizon where the heavenly bodies rise. The east and west points are the points in which the prime vertical intersects the horizon; and they are the origins whence amplitudes are reckoned.

EASTING. The distance in nautical miles which a ship makes to the eastward; it is the *departure* when sailing eastward.

Eastport. A port of entry of Washington Co., Me., on Moose Island, in Passamaquoddy Bay, 25 miles S.S.E. of Calais, and 100 miles E. of Bangor. The tide rises about 25 feet, and prevents the ice from obstructing the harbor. The town is on the eastern frontier of the United States; principally supported by the fisheries, lumber business, and coast trade. Pop. 3200.

Easy. A ship rolls *easy* when she rolls slowly and smoothly without sudden jerks. *Easy draft* is the same as *light draft.*

Eat. To make progress against a difficulty by slow degrees; as, to eat to windward. *To eat the wind out of a vessel* is to gain to windward of her by close attention to the helm, and developing the sailing powers to the utmost.

Ebb. The running out of the tide,—from the Anglo-Saxon *ep-flod.* See TIDE.

EBB, LINE OF. The strip of beach left dry by the tide.

Eburna. A genus of gasteropodous mollusks, having a smooth shell covered with a shining enamel.

Eccentric. A circular disk keyed on and revolving with a shaft, with the axis of which its centre does not coincide. It is used to convert a rotary motion to reciprocating motion, as in the valve-gear of steam-engines, and is equivalent to a crank having the distance between the crank-pin and shaft axis the same as the distance between the centre of the eccentric disk and the axis of the shaft. This device can be applied to shafts of all diameters without impairing their strength.

ECCENTRIC-HOOK. A hook or notch in one end of an eccentric-rod, by means of which the eccentric motion is readily connected with or detached from the remaining portion of the valve-gear, thus enabling the valves of an engine to be worked by the starting-bar and hand-gear. It is sometimes called a *gab.*

ECCENTRIC-HOOP, or STRAP. An adjustable band encircling an eccentric, which revolves within it, and to which the eccentric-rod is rigidly attached.

ECCENTRIC-ROD. A rod or bar, one end of which is rigidly secured to an eccentric strap or hoop, and the other end connected with such reciprocating parts of machinery as a Stephenson link, valve-stem cross-head, or rock-shaft arm of the valve-gear of a steam-engine. In engines that require to be worked by hand in starting, the end of the eccentric-rod is connected to the other valve-gear by an easily detached hook. See ECCENTRIC-HOOK.

Echineis. A genus of fishes, including the sucking-fish, or remora.

Echinus. A genus of Echinoderms; sea-urchin (*Echinus esculentus*); sea-hedgehog.

Eclipse (Gr. *ekleipsis*, from *ekleipein*, to leave out; to suffer a disappearance). The disappearing, in whole or in part, of a heavenly body in consequence of the intervention of another body.

A *lunar eclipse* takes place when the moon is in opposition, or on the opposite side of the earth from the sun (and when, therefore, it is full moon), provided she is at the same time very near one of her nodes, or the points where her orbit crosses the plane of the ecliptic. If the full moon is in the node, it will also be in the axis of the earth's shadow, and the eclipse will be *central*, possibly continuing for two hours, as the breadth of the shadow where the moon crosses it is about $2\frac{2}{3}$ the moon's diameter; when the full moon is so near the node as to be wholly immersed in the shadow, the eclipse will be *total;* and when only a part of the disk is immersed, the eclipse will be *partial.*

Instead of the earth and moon, we may contemplate any other planet that has a satellite. The satellite is eclipsed in the shadow of the planet, such phenomenon being to a spectator on the surface of the planet a lunar eclipse. We observe also the shadow of the satellite passing over the disk of the planet. By a spectator on a portion of the surface of the planet in such a case, a solar eclipse would be experienced; but as viewed from the earth, such a phenomenon is described as a *transit of the shadow* of the satellite.

The second case is where a body is eclipsed by the spectator passing through the shadow of the intervening body, the appearance being different according to the position of the spectator. This occurs in *solar eclipses.* When the moon is in conjunction—*i.e.*, in the same part of the heavens with the sun (and when, therefore, it is new moon)—the intersection of the moon's conical shadow with the earth's surface produces a black spot which sweeps over the illuminated hemisphere of the earth from west to east, and resembles in its effects a cloud carried by a west wind which hides the sun from the places nearly below it. To places over which the umbra passes, there will be a *total* eclipse; those places which the penumbra reaches will experience a *partial* eclipse. In case the umbra of the moon does not extend as far as the earth —or, in other words, when the moon's apparent diameter is less than that of the sun—a spectator below the centre of the umbra will see an *annular* eclipse, the dark disk of the moon being surrounded by a luminous "ring" of the sun's disk.

There is another class of phenomena analogous to eclipses, and which are sometimes included in the term. These are *occultations* and *transits.* An *occultation* is the hiding of a heavenly body from view by an apparently larger body intervening between it and the spectator. Thus the moon interposes and causes occultations of fixed stars and planets; the planets hide from view their satellites. A *transit* is the passing of a small body across the disk of a larger one. Thus, we have transits of the inferior planets, Mercury and Venus, across the face of the sun; and of this character, strictly speaking, is an annular eclipse of the sun by the moon. We have also transits of Jupiter's satellites across his disk.

The theory of eclipses was known to the Chinese at least 120 B.C. An eclipse was supposed by most of the Eastern nations to be the effect of magic; hence the custom among them of drumming during its continuance. The first eclipse recorded happened March 19, 721 B.C., according to Ptolemy; it was lunar, and was observed with accuracy at Babylon. The revolution of eclipses was first calculated by Calippus, the Athenian, 336 B.C. The Egyptians say they had accurately observed 373 eclipses of the sun, and 832 of the moon, up to the period from Vulcan to Alexander, who died 323 B.C.

Ecliptic (Gr. *ekleiptikos*, pertaining to an eclipse). So called because, that an eclipse of the moon may be possible, she must be in or near the path which the sun appears to describe annually in the heavens, round the earth as centre, from west to east, in consequence of the revolution of the earth in her orbit round the sun in the same direction.

The ecliptic is the natural equator of the heavens, and is the primitive circle in one of the systems of co-ordinates for defining points of the celestial sphere, and indicating their positions relatively to each other, the co-ordinates being longitude and latitude. The ecliptic is divided into twelve parts called "signs," each containing 30°, and receiving their names from constellations which were situated in them at the time the names were given. These divisions commence from the vernal equinoctial point, or first point of Aries.

Eddy. A current of air or water having a circular motion; the back-curl of the water under the stern. An eddy of wind may be caused by its striking against a bluff, sail, or other obstacle; an eddy in the water by a shoal, rock, point of land, etc.

Edge. *To edge away* or *to edge off* is to move off by slow degrees. *To edge down* is to approach an object by slow degrees, more particularly applicable to a sailing-vessel approaching an object in an oblique direction from to windward.

Eduction-pipe. See EXHAUST-PIPE.

Eduction-port. See EXHAUST-PORT.

Eel. A species of *Anguilla*, or of *Murœna*, etc., genera of soft-finned, snake-like fishes, belonging to the order *Apodes.*

The common eel of the eastern United States is the *Anguilla tenuirostris;* the conger-eel is the *Murœna conger.* The electrical eel of tropical South America belongs to the genus *Gymnotus.*

EEL-FARES. A brood of eels.

EEL-GRASS. The sea-wrack (*Zostera marina*).

EEL-POUT. A name for the burbot (*Molva lota*).

EEL-SKUYT. See DUTCH EEL-SKUYT.

EEL-SPEAR. A sort of trident for spearing eels.

Effects. Personal property.

Effluent. A stream which runs out of a lake, or another stream.

Eft. A saurian reptile, the *Lacerta seps* of Linnæus; a salamander, or newt, especially the common smooth newt.

Egg. *To egg on*, to provoke, to urge on,—from the Anglo-Saxon *eggion.*

Egmont Fowls. The large Antarctic gulls with dark-brown plumage; called also *shoemakers.*

Egyptian Herring. A name for the gowdanook, saury-pike, or *Scomberesox saurus.*

Eider-duck. The *Somateria mollissima*, a large duck of the northern seas; the down on the breast is valuable on account of its softness and lightness.

Eighen. The index of the early quadrant.

Ejectamenta Maris. Sea-products thrown on the beach. See JETSOM.

Eking. Making good any deficiency in the length of a piece of timber by scarfing or butting, as at the ends of hooks or knees. It is also a piece of carved work under the lower part of the quarter-gallery of a ship.

Elbing. A fortified seaport of West Prussia, 34 miles E.S.E. of Dantzic. It consists of an old town, a new town, and suburbs, and was until lately inclosed by walls, of which small portions remain. The manufactories of woolen cloths, refined sugar, vitriol, pearl-ash, tobacco, sail-cloth, etc., are very extensive. It has a very large trade. Pop. 36,000.

Elbow. A sudden change in the direction of a stream or channel. A promontory. See HAWSE.

Electrical Eel. A fish, or eel, of the genus *Gymnotus* (*G. electricus*), from 2 to 5 feet in length, capable of giving a violent electric shock.

Electricity. The theory most readily understood, and which most satisfactorily explains the various electrical phenomena, is as follows:

"That every substance and every atom of the world is pervaded by a peculiar, subtle, imponderable fluid which is termed *Electricity*, but which is not known to exist, or remains in a state of *electrical equilibrium*, until evoked by certain causes."

The effect of causing a disturbance of this equilibrium is to increase the normal, or natural, electricity in some particles, and to equally decrease it in other particles, *i.e.*, what one loses the other gains. An excess of natural electricity is denoted by the term *positive*, or mathematical symbol (+), while a deficiency is denoted by the term *negative*, or symbol (—).

Like electricities repel each other.

That is to say, two bodies charged with an excess of, or positive electricity, being brought together repel each other, neither wishing to increase the excess that has been evoked in them.

Similarly in the case of two bodies charged with a deficiency of, or negative, electricity, neither wish to add to the deficiency already there.

In both these cases there can be no tendency to electrical equilibrium, which is the principle at work. In the former case, there being already too much, more will but increase the disturbance.

In the latter case, further deficiency will but add to the irregularity.

Unlike electricities attract each other.

That is to say, if two bodies, one charged with positive, or having an excess of electricity, the other charged with negative, or having a deficiency of electricity, be brought together, they will attract each other; both being desirous of altering their existing state, the one by decreasing its excess, and the other by decreasing its deficiency of electricity.

In this case there will be a tendency to equilibrium, caused by attraction. The earth is supposed to be a vast reservoir of electricity, from which a quantity can be drawn to fill up a deficiency, and which is always ready to receive an excess from other bodies. Every body in nature has its own natural quantity of electricity, and when an object is negatively electrified, or has a deficiency in its normal quantity, there is a tendency to receive a supply from any convenient source. Such an object would receive electricity from the earth if means were afforded; and a body *positively* electrified would tend to part with its excess in the same manner. Where such facilities for establishing electrical equilibrium are afforded, the result is the passage of a *current* of electricity.

Conductors.—Sensible effects can be produced by electricity at great distances from the source, provided there be a medium of communication, that is, good *conductors* to transfer it. When a glass rod is rubbed with a piece of silk, it becomes charged with an excess of, or positive, electricity, and at the same time the silk becomes charged with negative electricity.

The glass rod will retain the positive electricity upon it for some time, unless touched with the wet hand, a wet cloth, a metal, etc., when it will instantly cease to be electrified. The electricity is then said to have been conducted away, and the bodies which allow it to run off the glass are called *conductors* of electricity. Metals, water, the human body, charcoal, damp wood, and many other bodies are conductors.

Those bodies which conduct electricity hardly at all, such as the air, silk, glass, sealing-wax, gutta-percha, india-rubber, etc., are termed *non-conductors* or *insulators*.

Strictly speaking, all substances *conduct* electricity in some degree, and a *non-conductor* is merely a *bad* conductor.

In the following table the bodies are arranged in their order of conductivity, *i.e.*, each substance conducts better than that which precedes it; the first-named body is the best insulator, and the last-named one is the best conductor.

Dry air.	Shellac.
Ebonite.	India-rubber.
Paraffin.	Gutta-percha.
Resin.	Saline solutions.
Sulphur.	Acids.
Sealing-wax.	Charcoal, or Coke.
Glass.	Mercury.
Silk.	Lead.
Wool.	Tin.
Dry paper.	Iron.
Porcelain.	Platinum.
Dry wood.	Zinc.
Stone.	Gold.
Pure water.	Copper.
Rarefied air.	Silver.
Sea-water.	

Though two substances are near one another in the above list, they do not necessarily approach one another in their power of conducting. For instance, taking the conducting power of pure silver as represented by the number 100, then

Pure Copper will be equal to 99.9,
Gold will be equal to 78.0,
while Zinc will be only equal to 29.0,

and pure water, which is half-way down the list, will offer 6754 millions more resistance than silver to the passage of the electric current.

The metals being the best-known conductors,

are usually employed as the means of transferring the electric current from one place to another.

Electric Circuit.—The conditions attending this operation are different from those of any other known method of transmission.

A complete *circuit* must always be formed by the electric current, *i.e.*, it cannot start from one place *A*, travel to another place *B*, and cease there, but the current must be completed before it can be said to have reached *B*. There cannot be a current of electricity without a means of recombination, which recombination must be at the *source*, or place of original disturbance.

This "place of disturbance" or *source* must be considered as having two sides, *i.e.*, at some spot the normal or natural electrical equilibrium is disturbed, and electricity is separated into too much (positive) on one side, and too little (negative) on the other side. If then no means of recombination be afforded, the electricities remain separated, and no current exists; but if a *conductor* be made to connect the two sides, electricity is set in motion, and a current established. Originally, to form a circuit between two stations *A* and *B*, a conducting wire and a return wire were necessary, but in 1837 Steinway discovered that the earth itself answered all the purposes of a return wire, in fact, under favorable conditions, much better. Thus, to form a circuit between *A* and *B*, a conducting-wire is required, and a buried metal plate at *A* and *B*, the earth by these means taking the place of the return wire.

The aforesaid metal plates are technically termed *earth-plates.* The greater the size of the earth-plates (up to certain limits), the deeper they are buried, and the better the conducting power of the soil surrounding them, the better conductors the plates become, or the less resistance the earth portion of the circuit offers. If either plate be not in communication with the earth, or else be separated from the wire, the circuit is not complete, or, as it is termed, "it is broken," and no current will flow, the signal not made, torpedo not fired, etc.

"*Short*" *Circuit.*—Due to the fact that recombination, or a tendency to equilibrium, is always at work when electricity has been evoked, the conducting path along which the electric current flows must be covered with a non-conducting substance, or, as it termed, "insulated," or else the current would not perform its duty, but escape to earth, and so form what is termed a "short" circuit.

A current of electricity always chooses the *easiest path* to effect recombination, or electrical equilibrium.

Insulators, etc.—On land, telegraph-wires are, as a rule, laid above the ground, and therefore require supporting at every few yards; this is done by means of posts, and as these are formed of substances which are conductors of electricity, the wires require to be insulated from them. The insulators generally employed for such purposes are cup-shaped pieces of porcelain, or pottery, fixed to the head of the telegraph-posts. By means of these insulators, the current of electricity is prevented from escaping to the earth by the post-conductors.

A certain amount of leakage, or loss of electricity, must occur at each of these posts, as there is no such thing as a perfect insulator. When the wires are laid on the ground or under ground, or under water, they are insulated by covering them with gutta-percha, india-rubber, etc., and any loss of current is thus prevented.

Methods of generating Electricity.—For the purposes of torpedo warfare there are two methods of evoking electricity, viz.:

1. By *chemical action.*
2. By *friction.*

By Chemical Action.—*Chemical action* is the chief source of free electricity, the representative of which is the galvanic, or Voltaic, battery.

The electricity so generated is also termed dynamical electricity, due to there being a constant electric current, so long as the poles of the battery producing it are kept closed; the electricity being thus in a *dynamic* or moving state.

By chemical action is signified that which occurs when two or more substances so act upon one another as to produce a third substance differing altogether from the original ones in its properties, or when one substance is brought under such conditions that it forms two or more bodies differing from the original ones in their properties.

Definition and Properties of a Voltaic Cell.—The *Voltaic* cell consists of an insulating jar, containing a liquid, in which are placed two plates or pieces of dissimilar metals; the liquid must be composed of two or more chemical elements, one of which at least tends to combine with one or other of the metals, or *with both in different degrees.*

By a Voltaic *battery* is meant a number of cells above one; this term, however, is often applied to a single cell when working by itself.

A "*simple* Voltaic cell," "element," or "couple," consists of two metals placed in a conducting liquid. If two metals—for instance, zinc and copper—are placed in water slightly acidulated, without touching each other, no effect is apparent; but if they be made to touch, bubbles of hydrogen gas are formed over the copper plate, and continue forming there until the plates are separated. After being in contact for some time, the copper plate will be found unaltered in weight, but the zinc plate will have lost weight, and the portion so lost will be found in the liquid in the form of sulphate of zinc. The same effects are also produced by connecting the two plates by means of some conducting substance instead of placing them in contact.

Zinc is invariably employed as one of the metal plates, on account of the ease with which it dissolves in dilute acids; and the greatest results are obtained when the second metal plate is not acted upon at all by the liquid, for then the whole effect due to the oxidation of the zinc plate is obtained; but when the second plate is also chemically acted upon, then only the effect due to the difference between the two chemical actions is obtained, for they each act in directly opposite directions.

Voltaic Current.—The Voltaic current makes its appearance under the general laws of electrical action.

When a body charged with an *excess* of, or *positive*, electricity, is connected with the earth, electricity is transferred *from* the charged body to the earth; and similarly when a body charged with a *deficiency* of, or *negative*, electricity, is

connected with the earth, electricity is transferred *from* the earth to the body.

Generally, whenever two conductors in different electrical conditions are put in contact, electricity will flow from one to the other. That which determines the direction of the transfer is the relative *potential* of the two conductors. Electricity always flows from a body at *higher potential* to one at *lower potential*, when the two are in contact, or connected by a conductor. When no transfer of electricity takes place under these conditions, the bodies are said to be at the *same potential*, which may be either *high* or *low*. The *potential* of the earth is assumed to be *zero*.

Definition of Potential.—"The *potential of a body or point, is the difference between the potential of the body or point, and the potential of the earth.*"

Difference of potential for electricity is analogous to difference of level for water. Now, since, when a metal is placed in a vessel containing a liquid, electricity is produced, the liquid becomes of a different potential to the metal, each being electrified in an opposite way; and therefore, as above stated, there being a *difference* of potentials, electricity will tend to flow from one to the other.

This is evidence of a *force* being in action, for there can be no motion without some force to produce it.

Electro-motive Force.—Electro-motive force is the name given to a peculiar force to which is due the property of producing a difference of potential. When it is said that zinc and water produce a definite electro-motive force, what is meant is, that by their contact a certain definite difference of potentials is produced.

The *electro-motive force* of a Voltaic element may be termed its *working* power, in the same way as the pressure of steam is the working power of a steam-engine, though this is not to be considered as the real source of power, which, as will be seen, is uncertain. Due to the difference of potential of the metal and the liquid, a current of electricity will flow from one to the other, causing the chemical decomposition of the liquid, and the reaction may be taken as the origin of the power employed.

But while the expenditure of energy (which is necessary to produce a *force*) is accounted for by taking the chemical action as the source of power, the preceding cause of this chemical action, viz., the flowing of the current of electricity due to the difference of potential of the metal and the liquid, must also have first involved the expenditure of energy; thus the real source of power is very uncertain.

Electrolytes.—As before stated, a Voltaic cell consists of two plates of dissimilar metals, which must be immersed in a liquid composed of two or more chemical elements, one of which at least will combine with one or other of the metals, or both in a different degree. Those liquids which are thus decomposed by the passage of a current of electricity are termed *electrolytes*.

The elements, then, forming the electrolyte may have chemical affinity for both metals, though in a greater degree for one than the other.

"Oxygen" is the most important element of an electrolyte, and to the *affinity for oxygen of the metals* is the magnitude of the result and effect.

Terms Electro-positive and Electro-negative.—All metals have a definite relation to each other as to the potential which any one may have when brought into contact with another. Thus, when zinc is brought into contact with copper, the former has a potential positive to the latter, *i.e.*, a current of electricity will tend to flow from the zinc to the copper. The metals may be so placed in a list that each one would be positive to any of those that follow it; it is then said to be electro-positive to them, and they are electro-negative to it. As those metals which are electro-positive to others have a greater affinity for oxygen, and those that are electro-negative to others a less affinity for this element, the terms electro-positive and electro-negative signify, in effect, greater or less affinity for this element. Conversely, oxygen will combine more readily with the former than with the latter.

The following list shows the commoner metals arranged in electro-chemical order:

+ Zinc.
Lead.
Tin.
Iron.
Antimony.
Copper.
Silver.
—Gold.

Take the case of a Voltaic cell composed of zinc and copper plates immersed in water.

The passage of electricity through the water will decompose it into its elements hydrogen and oxygen, the latter having an affinity for both the plates, but considerably more so for the zinc plate.

Then, an electro-motive force will be generated at each metal, and these forces will act in opposition to each other, but the greater strength of the one will overcome the weaker, and the real power of the electric current will be the difference between the two.

Definition of "Elements."—The battery-plates are termed the positive and negative *elements*. A Voltaic battery has two *poles*,—a positive and a negative,—which are the terminations of the plates.

Direction of Current.—The course of the current in a Voltaic cell is as follows: *Within* it leaves the electro-positive plate (or element), and flows to the electro-negative plate, but *outside* the cell (or as it were on its return path) it flows from the positive *pole* to the negative *pole*. The current always leaves the battery by the positive *pole*, and thus the copper is the negative *element*, but the positive *pole*, because the current leaves the battery by it; and the zinc is the positive *element* because the current begins there, *within* the cell, and the negative *pole* because it ends there, *outside*.

The positive pole is the terminal of the negative plate, and *vice versa*. There is but one current from a battery, viz., a positive one; what is called a negative current is merely the positive current passing in the reverse direction from the same pole, that is, the positive pole.

Single and Double Fluid Batteries.—Galvanic batteries may be divided into single fluid and double fluid batteries. The simplest form of

galvanic cell practically in use is a single fluid cell, consisting of a zinc and a copper element, immersed in water slightly acidulated by the addition of a little sulphuric acid. In a battery of several cells, the zinc and copper plates are generally soldered together in pairs, and placed in a long stoneware or glass trough divided into separate cells by means of partitions. By filling the cells with sand, this battery is made more portable, the plates being thus supported, and the liquid prevented from splashing about during transit.

In this form it is called the *common sand battery.*

Action in a Single Fluid Cell.—The following process goes on in the single fluid cell when the circuit is closed,—that is, when the battery is set to work.

The water (composed of hydrogen and oxygen) is decomposed by the passage of the electric current, and oxide of zinc is formed. The oxygen of the water having greater affinity for the zinc, leaves the hydrogen. The zinc during the process is being consumed, as coal is consumed when it burns, while combining with the oxygen of the air. This oxide of zinc combines with the sulphuric acid, and forms sulphate of zinc; this salt is found to accumulate in solution in the liquid of the cell. At the same time the hydrogen of the water goes to the negative or copper plate, and gathers over it in bubbles.

The process will be better seen by the accompanying plan of the chemical decomposition and recombinations.

Sulphuric acid.................................. } Sulphate of zinc found at positive plate.
Zinc........................ } Oxide of zinc. }
Water { Oxygen...... }
Water { Hydrogen..............................Hydrogen found at negative plate.

No *single fluid* cell can give a constant electromotive force, because of the *polarization* of the plates.

Definition of the term "Polarization."—The word *polarization* means that the plates become coated with the products of the decomposition of the *electrolyte*, producing a diminution of current. In the above-described battery, the hydrogen gathers on the surface of the copper plate, and an *electro-motive force* is set up which counteracts the electro-motive force producing the current,—the copper plate is said to be *polarized.* By the bubbles of hydrogen collecting on the face of the negative plate, the *surface* in contact with the liquid is gradually decreased; thus the plate becomes practically smaller, and a single fluid cell which at starting gave a good current soon shows that it is really weakened. The consequence is that the zinc is consumed extravagantly, as well as the acid, and the cell works with poor results. Also the *resistance* of the cell is increased, due to the sulphuric acid, which is added to the water to increase its conductivity, being gradually used up, by combining with the oxide (see plan) and forming sulphate of zinc. Liquids are very bad conductors of electricity; the greater part of the ordinary internal resistance of a battery arises from this cause. The common sand battery is the worst of all batteries as regards constancy of electro-motive force, the *polarization* being greater in this battery than any other, because the gas cannot readily escape. The common copper and zinc cell is the next in order of demerit. The *Smee* single fluid cell, in which the negative plate is a platinum instead of a copper one, is better than the copper zinc cell, because the free hydrogen does not stick to the rough surface of the platinum plate so much as to the copper.

Double Fluid Batteries.—All the defects of the single fluid battery, which are as follows:

1. Diminution of electro-motive force,
2. Inconstancy,
3. Increase of internal resistance,

are remedied in the *double fluid* battery, of which the *Daniell cell* was the first invented, and is a good example. Of this kind of cell many forms are in use, but the principle is the same throughout. There is a positive and negative element, and the cell is divided into two receptacles for the two fluids. In the most constant form of Daniell cell, the zinc is plunged into a semi-saturated solution of sulphate of zinc, the copper in a saturated solution of sulphate of copper, and these two solutions are separated either by a porous barrier, or by taking advantage of the different specific gravities of the two solutions. By a *saturated* solution is meant a liquid which has dissolved as much of the substance as it possibly can.

The Chemical Action of a Daniell Cell.—The chemical action of this form of Daniell cell is as follows:

The zinc electrode combines with oxygen; the oxide thus formed combines with sulphuric acid and forms sulphate of zinc. Oxide of copper is separated from the sulphate; and the copper in this oxide is separated from the oxygen. The oxygen of the water is separated at the zinc electrode from the hydrogen, and at the other electrode this hydrogen recombines with the oxygen from the oxide of copper. This alternate decomposition and recombination of the elements of water can neither increase nor decrease the E.M.F. of the cell, the actions being equal and opposite. The result of the series of actions above described is that the sulphuric acid and oxygen of the sulphate of zinc are transmitted to the zinc, combine with it, and form fresh sulphate of zinc; the sulphuric acid and oxygen of the sulphate of copper are transmitted to the zinc set free by the above process, and reconvert it into sulphate of zinc; the copper of the sulphate of copper is transmitted to the copper electrode, and remains adhering to it. The whole result is therefore the substitution of a certain quantity of sulphate of zinc for an equivalent quantity of sulphate of copper, together with a deposition of copper on the copper or negative electrode. The following is a plan of the process:

Zinc...................... } Oxide of zinc... } .... { Sulphate of zinc found at positive plate.
Water { Oxygen.... }
Water { Hydrogen.......................... .... } Water.
Sulphate of copper. { Sulphuric acid ....
Sulphate of copper. { Oxide of copper.. { Oxygen ..... }
Oxide of copper.. { Copper .... { Copper at negative plate.

The Circuit.—In connection with the manipulation of batteries, there is one important item to consider, viz., the *resistance* in the *circuit*, which may be divided into *external* and *internal.*

Resistances.—The *external* resistance in prac-

tice is that which exists in the conducting-line, and the various instruments connected with it.

The *internal* resistance is that which exists in the battery itself. All known conductors oppose a sensible *resistance* to the passage of an electric current, and the strength of the current, or in other words, the quantity of electricity passing per second from one point to another, when a constant difference of potentials is maintained between them, depends on the *resistance* of the wire or the conductor joining them. A bad conductor does not let the electricity pass so rapidly as a good conductor, that is, it offers more *resistance.*

Resistance in a wire of constant section and material is *directly* proportional to the *length*, and *inversely* proportional to the *area of the cross-section.*

The electrical resistance of a conductor must not be considered as analogous to mechanical resistance, such as the friction which water experiences in passing through a pipe, for this frictional resistance *is not* constant when different quantities of water are being forced through the pipe, whereas electrical resistance *is* constant whatever quantity of electricity be forced through the conductor.

Application of Ohm's Law.—Ohm's law, which governs the strength of the current, is expressed by the equation

$$C = \frac{E}{R} \text{ or } R = \frac{E}{C} \text{ or } E = CR.$$

Where C is the strength of the current;
E is the E.M.F., or difference of potentials;
and R is the resistance of the circuit.

In words, *Ohm's law* means that the strength of the current is *directly* proportional to the E.M.F., and *inversely* proportional to the resistance of the circuit.

As before stated, the resistance of the circuit consists of an *external* and an *internal* resistance, therefore when these resistances are separately considered, the equation $C = \frac{E}{R}$ must be converted into $C = \frac{E}{x + r}$, where x is the external, and r the internal, resistance.

The resistance of the battery or the *internal resistance* depends on the size of the plates and the distance between them; that is, it is *directly* proportional to the distance, and *inversely* proportional to the size.

The *electro-motive* force of a battery is dependent generally on the number of cells joined in *series*, and not on the *size* of the plates. The cells of a battery may be joined in two ways, as follows:

1. In series: that is, by connecting the negative element of one cell to the positive element of another, and so on.
2. In multiple arc: that is, by connecting negative to negative, and positive to positive; which is the same as increasing the size of the cells.

If the conductor between the battery poles be such that the *external* resistance x may be practically left out, then $C = \frac{E}{r}$, and no change in the strength of the current will be effected by adding any number of cells in series, as r will increase equally with E, and therefore C will remain the same; but if under the same conditions the cells be joined in *multiple arc*, then r will decrease as E increases, and therefore C will be increased.

Thus with a short circuit of small external resistance, the strength of the current will be increased by increasing the size of the plates, or by joining the cells in multiple arc, but not in series.

If the conductor between the poles of the battery be such that the external resistance x becomes very great, then $C = \frac{E}{x + r}$, where x is very great compared to r. By joining the cells in multiple arc r is decreased, but E and x remain the same, and therefore C is not materially altered, as x is very great compared to r. By connecting the cells in series, r is increased, and so is E, but as r is still very small compared to x, the strength of the current C is increased.

Thus with a long circuit of great *external* resistance, the strength of the current will be increased by joining the cells in series, but not in multiple arc.

When the external resistance x is neither very large nor very small in comparison with the battery or internal resistance r, then the strength of the current C will be increased by adding the cells in series, and also in multiple arc. By the former process the E.M.F. E is increased more than the resistance of the circuit R or $(x + r)$, and by the latter process the E.M.F. E is unaltered, whilst the circuit resistance $(x + r)$ is decreased. All the above may be practically demonstrated by the employment of suitable *galvanometers.*

Frictional Electricity.—Frictional electricity is produced by the friction of two insulators. There is *no difference whatever in kind* between "Voltaic" and "frictional" electricity.

Comparison with Voltaic Electricity.—The electricity generated by friction possesses a great electro-motive force, producing on even a small conductor a large charge, whereas the electricity generated by the galvanic cell possesses a very small electro-motive force, and produces only a small charge on a small conductor. But when the conductor is large, the electricity produced by the galvanic cell will almost instantaneously charge the conductor to the maximum potential it can produce, the galvanic cell developing an immense quantity of electricity by the chemical reaction; whereas the quantity developed by friction between two insulators is so small, that if it be diffused over a large conductor the potential of the conductor will be very little increased.

The late Professor Faraday has proved that one cell of a Voltaic pile possesses the same quantity of electricity as an ordinary-sized frictional machine after being wound round 800,000 times, thus showing the contrast between the qualities of frictional and Voltaic electricity.

The electricity of the frictional machine and that of the galvanic battery may be made to produce the same effect, there being no difference in kind between them. Frictional electricity can be made to pass in a current, but it is comparatively feeble. Again, Voltaic electricity can be made to produce a spark, but under ordinary circumstances it scarcely amounts to anything.

Description of a Frictional Electric Machine.—

A frictional electrical machine consists of a vulcanite or glass disk or cylinder, which is made to revolve between cushions or rubbers of leather or silk. By the friction the (silk) rubbers become negatively, and the glass disk or cylinder positively, electrified. The revolving disk immediately after contact with the fixed rubbers passes close by a series of brass points, which are connected with a *condenser*. These points collect the positive electricity of the glass, the rubbers being put to earth. The positive electricity which the glass loses is supplied through the rubber; a stream of negative electricity flows from the rubbers to the earth during the charging of the conductor or condenser; in other words, the positive electricity flows from the earth to the rubber, whence it crosses to the glass disk and so to the condenser.

Definition of a "Condenser."—A *condenser* is an arrangement for accumulating a large quantity of electricity on a comparatively small surface.

The "Leyden Jar."—The *Leyden jar*, which is the original type of the condenser, or accumulator, consists of a glass jar coated inside and out, up to within a few inches of the mouth, with tin-foil pasted on, but having no connection with each other. The mouth is usually closed by means of a wooden stopper, through which a brass rod passes, to the head of which is affixed a brass knob, etc., the rod and knob being metallically connected with the *inner* coating by means of a chain.

The "Leyden jar" may be charged either by connecting the *outer* coating to earth (the rubbers of the machine being also to earth), and the *inner* coating to the conductor of the machine; or else by connecting the outer coating to the rubbers, and the inner coating to the conductor, a complete circuit being necessary to charge the jar as highly as the frictional electrical machine will admit of.

The *conductor* of the machine being charged, also forms a kind of Leyden jar, the conductor in this case being the inner coating, the air, the *dielectric*, and the nearest surrounding conductors, such as the walls of the room, etc., being the outer coating.

Meaning of "Dielectric."—By *dielectric* is meant a non-conducting medium, which in the case of the "Leyden jar" is the glass.

Frictional Electricity very little used for Torpedo Purposes.—Frictional electricity is now seldom used in connection with torpedo warfare, as on account of its very great power, or electromotive force, a very perfectly insulated cable must be employed, which is somewhat difficult to obtain; it is also necessary to employ a condenser, which requires a certain time to charge. For these and other reasons, frictional electricity has been abandoned for the far more practical Voltaic electricity.

Magnetism.—A *magnet* is a piece of steel, which has the peculiar property, among others, of attracting iron to its ends.

Certain kinds of iron ore, termed the *loadstone*, have the same properties. The word "*magnet*" is taken from the country Magnesia, where the loadstone was first discovered.

Magnetism in a body is considered to be a peculiar condition caused by electrical action. Both electricity and magnetism have the power of communicating their properties to other bodies without being in contact with them, *i.e.*, *inducing* the power, which on the bodies being placed far apart becomes insensible.

The "Poles" of a Magnet.—Every magnet has two *poles*, called the *north* and *south* poles. A magnetic steel needle if pivoted on an upright point, or suspended from its centre, will fix itself, pointing north and south; in England the end of the needle pointing to the north is termed the north pole, but in France it is termed the south pole. The reason of this difference is owing to the fact that the north pole of one magnet attracts the south pole of another, and therefore, as the earth is considered as one vast magnet, the end of the magnetic needle attracted to the north pole of the earth should be the south pole of the magnet; thus the French south pole in a magnet is the English north pole, and *vice versa.*

Permanent Magnets.—A piece of steel when magnetized is termed a *permanent* magnet, because it retains its magnetism for a considerable length of time; but soft iron cannot be permanently magnetized.

A piece of soft iron rendered magnetic by induction retains a portion of its magnetism for some time after it has been removed from the magnetic field, by reason of what is called its *coercive force.* This remnant of magnetization is called *residual magnetism.*

Effect of an Electrical Current on a Magnetic Needle.—A magnetic bar or needle pivoted on its centre will point north and south, but if an electric current is caused to flow along a wire parallel to and either over or under the magnetic needle, the latter will be turned from its position, and remain so as long as the current continues; on the current ceasing the needle will resume its original position.

The magnetic needle can be turned either to the east or the west, according to the direction and course of the electrical current.

Thus:

Current from S. to N. *over* deflects to W.
Current from N. to S. *under* deflects to W.
Current from N. to S. *over* deflects to E.
Current from S. to N. *under* deflects to E.

The Galvanometer, the "Mirror," and "Thomson's Reflector" all depend on this principle for their usefulness.

The Electro-Magnet.—If a piece of insulated wire be coiled round a rod of soft iron, and a current of electricity be made to pass through the coil, the iron core becomes magnetic as long as the current passes; when the current ceases the magnetism disappears.

During the passage of the electric current, the iron core possesses all the properties of a magnet. Therefore if a piece of iron were placed near its poles it would be attracted and released from attraction as often as the current passed or ceased; and supposing such a piece of iron to be retained by a spring, etc., a series of movements, attraction, and drawing back would be effected.

A piece of iron so arranged is termed an *armature*, and the instrument is called an *electro-magnet.*

The coil of wire must be carefully insulated, or else the electric current will pass through the iron core to earth instead of performing its proper work.

* An electro-magnet is much more powerful than a steel magnet of equal dimensions, and depends on the strength of the current by which the magnetism is induced, and the number of turns of wire round the core. The north and south poles of an electro-magnet are determined by the direction in which the current flows through the wire.

At the *south* pole the current passes *with* the hands of a watch, and at the *north* pole *against* the hands of a watch.

Definition of the "Ohm."—The "ohm" is the standard used for electrical resistance; it is obtained by observing what effect is produced by a current of electricity on a certain conductor in a certain time.

The ohm is a small coil of German silver wire representing the resistance overcome by a current in a certain time. See TORPEDOES.

Electro-ballistics. In the earlier days of gunnery the accurate determination of the velocity of a projectile was a most perplexing problem, and taxed the ingenuity of some of the most scientific minds. The celebrated Benjamin Robins, about the middle of the 18th century, produced his ballistic pendulum, and both he and Count Rumford directed attention to the gun pendulum as a means for determining the initial velocity of projectiles. Each of these devices was extensively experimented with, by Hutton, in England, 1775–91; at Metz, 1839–40; and by Mordecai in this country, 1843–48.

In 1840, Professor Wheatstone first proposed the employment of electricity in determining the velocity of projectiles, and his suggestion was tested practically with satisfactory results. Subsequent researches by the late Professor Henry, of the Smithsonian Institution, led to improved modes of determining the most difficult problems in gunnery by means of electricity, and to him belongs the credit of having first proposed the use of the spark from what is now known as the Ruhmkorff coil, which has since been employed in the most successful instruments.

The mode of determining the velocity of projectiles by means of electricity may be stated, in general terms, as follows: Two wire screens, or targets, forming part of a galvanic circuit, are so placed as to intercept the flight of the projectile, which, as it passes through them, breaks the circuit. The instant of rupturing the target-wire is recorded by means of the electrical instrument employed, various ingenious designs of which exist, some of which are enumerated below. In this way the time occupied by the projectile in passing from the first to the second target is obtained; dividing the distance between the targets by this time, the velocity of the projectile at a point midway between the targets is found. In order to get the muzzle, or initial velocity, it is necessary to calculate the loss due to the resistance of the air over the space from the gun to the midway point between the targets.

The following are the electro-ballistic machines chiefly used by ordnance officers in this country:

Benton's West Point machine, which consists of a bed-plate of metal supporting an arc placed in a perpendicular position and graduated. Suspended perpendicular to the plane of this arc are two pendulums, having a common axis of motion passing through the centre. Two electro-magnets are attached to the horizontal limb of the arc to hold up the pendulums when they are deflected through angles of 90°. There is also an apparatus which records the point at which the pendulums pass each other, when they fall by the breaking of the currents which excite the magnets. The velocity of the electric currents being considered instantaneous, and the loss of the power of the magnets simultaneous with the rupture of the currents, it follows that each pendulum begins to move at the instant that the projectile cuts the wire, and that the interval of time corresponds to the difference of the arcs described by the pendulums up to the time of meeting.

The Navez-Leurs chronoscope, in which two similar pendulums—chronometer and register—having the same axis of suspension, their bobs supported at the extremities of a graduated arc of 180° by electro-magnets, are successively released upon the rupture, by the projectile, of the conducting-wires of their respective magnets. An index-needle oscillating by frictional attachment with the chronometer pendulum, automatically clamped at the instant of passing to the graduated arc, affords the means of determining the interval. Here may be mentioned the remarkable application by Col. Benton, in his velocimeter, of the principle "that the loosening effect of cutting a taut thread is transmitted to equal distances along the thread from the point of rupture in equal or sensibly equal times." This velocimeter, operated by a single person, who may also fire the gun, gives results sufficiently accurate for all the practical purposes of proving powder and making ballistic calculations.

Le Boulengé's chronograph, in which two weights supported by electro-magnets fall successively. The first, a long cylindrical rod (chronometer), falls at the rupture of the first wire; the second (registrar) falls, at the rupture of the second wire, upon a trigger, releasing a spring-cutter, which indents the chronometer-rod. From the difference of the spaces described the interval of time is computed.

The Schultz chronoscope, in which upon the lamp-smoked surface of a metal cylinder, having helical motion, a vibrating fork traces a time-scale. The rupture by a projectile of the primary wire of a Ruhmkorff coil, with an independent battery, induces in the secondary wire, one end of which is connected with the cylinder, the other carefully insulated, near it and just over the fork, a current; a spark projected to the surface of the cylinder leaves a bright spot at that point, indicating the instant of rupture. For the *Foucault* contact-breaker, has been substituted, at West Point, with apparent advantage, *Russell's* electric interrupter, in which a simple spring makes the fork its own interrupter.

The Bashforth chronograph, in which, with the aid of a clock, a time-scale is traced upon a cylinder, rotating about a vertical axis, by a marker at end of a lever actuated by an electro-magnet and an opposing spring attached to a plate, having a nearly uniform motion of translation in a vertical plane parallel to the axis of the cylinder. The helical path described by the

marker is interrupted at each second by a movement of the lever. A second lever and marker with electro-magnet and spring, also attached to the plate but connected with the screens, records the passage of the projectile. The markers being in close proximity the intervals are readily determined.

The Noble chronoscope, with which time records have been obtained for distances of 2.4 inches in the bore of a 10-inch gun, while the total time to reach the muzzle, a distance of 100 inches, when fired with a full charge, is about the one-hundredth part of a second. In this instrument metal disks, covered on the edge with white paper coated with lamp-black, rotating with high velocity, are connected with one end of the secondary wire of an induction coil, the other, carefully insulated, is brought to a discharger opposite the end of its corresponding disk, just clear of it. A spark perforates the paper at the instant of disruption of the primary wire, which, introduced by means of hollow steel plugs into holes bored through the walls of the gun, is severed by a cutter under pressure of the passing projectile. The angular velocity of the disks is determined by means of a stop-cock, which can be connected with the shaft. The linear velocity usually obtained is 1000 inches per second. By a vernier, reading to the one-thousandth part of an inch, intervals of time as minute as the one-millionth part of a second may be measured.

In the electric clepsydra, invented by Le Boulengé, the flow of mercury from a reservoir through a fine orifice, opened or closed by levers actuated by electro-magnets, upon the breaking of the electric current by the projectile, affords the means of determining the interval with great precision. See BALLISTIC PENDULUM, GUN PENDULUM.

Elephanter. A heavy periodical rain of Bombay.

Elephant-fish. The *Chimæra callorynchus*, so called because of a protuberance on its nose.

Elevate. In pointing a gun, *to elevate* was to raise the muzzle higher; the orders are now given in regard to the breech instead of the muzzle, so that the command *lower* corresponds to the old word *elevate*.

Elevated Pole. The pole which is above the horizon of the spectator.

Elevation, Angle of. See SIGHT, ANGLE OF.

Eligug. An aquatic bird of passage of the auk kind; called also *razor-bill*.

Elleck. A name for the *Trigla cuculus*.

Elliott, Jesse Duncan, Commodore U.S.N. Jesse D. Elliott was born in Maryland in 1782. He entered the navy as a midshipman in 1804. Served in several vessels, and was promoted to lieutenant in April, 1810. Was ordered to Commodore Chauncey's squadron on Lake Ontario in 1812. Having been sent to Lake Erie to gather ships, he captured the English brigs "Detroit" and "Caledonia" in a boat expedition. For this, the first naval success on the lakes, he was awarded a sword by Congress. Commanded the "Conquest" in Chauncey's squadron, and led in the brilliant attack on the enemy at Kingston, on the 8th of November. He next commanded the "Madison," 24, in the capture of York, Canada, April 19, 1813, and attack on Fort George, May 25. Was promoted to master commandant in July, 1813. In August he was transferred to Lake Erie, under Perry. Commanded the "Niagara," 20, and participated in the victory on that lake, September 10, 1813. For bravery in that action he received a gold medal. Received the command from Perry on the 25th of October. Commanded the "Ontario," 22, in Decatur's squadron to Tunis and Algiers, sailing May 20, 1815, and returning the same year. Promoted to captain, March 27, 1818. From 1817–24 was a commissioner to select sites for light-houses, and fortifications for North Carolina. Commanded Brazil Squadron, 1825–28; West India Squadron, 1829–32; Charlestown Navy-Yard, 1832–35; and Mediterranean Squadron, in the "Constitution," 1835–38. From 1839–40 was waiting orders, and under suspension from 1841–43 for various irregularities in his conduct. Waiting orders, 1844; navy-yard, Philadelphia, 1845; and died there, December 10, 1845, aged 63. Was energetic, brave, and reliable, but fitful in temper.—*F. S. Bassett, Lieutenant U.S.N.*

Elliott-eye. An eye worked over a thimble in the end of a cable or hawser.

Ellipse (Gr. *elleipsis*, a falling short of). A curve such that the sum of the distances to any point from two given points, called the *foci*, is constant. The orbits of the planets are ellipses, as are the terrestrial meridians. See CONIC SECTIONS.

Ellison, Francis B., Commodore U.S.N. Born in New York. Appointed from New York, May 28, 1819.

Commissioned as lieutenant, May 17, 1828; schooner "Porpoise," Mediterranean Squadron, 1827–29; receiving-ship, New York, 1833–34; navy-yard, 1837; frigate "Brandywine," 1840; store-ship "Lexington," Mediterranean Squadron, 1845; navy-yard, New York, 1847–48.

Commissioned as commander, May 29, 1850; inspector, etc., New York, 1853–54; commanding sloop "Jamestown," coast of Africa, 1855.

Commissioned as captain, March 2, 1857.

Commissioned as commodore, July 16, 1862; light-house inspector, 1866–68. Retired October 1, 1864.

Ellsworth, a city and port of entry, capital of Hancock Co., Me., is on the Union River, a few miles from the ocean, and 28 miles S.E. of Bangor. The prosperity of this place is mainly derived from the lumber business, navigation, and ship-building. Pop. 5500.

Elmo's Fire, St. See ST. ELMO'S FIRE.

Elops. A fish inhabiting the seas of America and the West Indies; the *Elops saurus*, or saury.

Elver. A young conger- or sea-eel.

Embargo. A prohibitory order, issued by the government of a state to prevent the sailing of foreign (or, in certain exigencies, home) shipping from its ports. A willful breach of embargo discharges the underwriters from liability.

Embark. To go on board, or to put on board a vessel.

EMBARKATION. The shipping of goods, troops, and stores.

Embarment. An old term, meaning an embargo.

Ember-goose. A name for the great northern diver or loon (*Colymbus glacialis*).

Embezzlement. The fraudulent appropria-

tion to one's own use of money or property intrusted to one's care or management.

In the merchant service mariners are bound to contribute out of their wages for embezzlements of the cargo. If the embezzlement be fixed on any individual, he alone is responsible. If it has arisen from the fault, fraud, connivance, or negligence of any particular portion of the crew, they are bound to contribute to the reparation of the loss in proportion to their wages; and when the circumstances of the case create a strong presumption of guilt against the whole crew, all must contribute. Where no reasonable presumption against their innocence is shown, the loss must be borne exclusively by the owner or master.

Embouchure. A French word adopted as signifying the mouth of a river, by which its waters are discharged, or by which it is entered.

Emden, or Embden. A fortified seaport town of Prussia, near the Dollart, 14 miles S.W. of Aurich. The town is intersected by canals connected with the harbor, and is a railway terminus. Principal edifices, the council and custom-houses, barracks, school of navigation, etc. The port is shallow, but the roadstead is deep enough for vessels of any size. Large ship-building docks are located here. Pop. 13,000.

Emeralders. A term for the natives of Ireland, from its evergreen verdure.

Emergencies at Sea. Emergencies at sea are those sudden and unforeseen occurrences which require the promptest action to avert disaster. The most common of these are an alarm of fire, collision with another vessel, running suddenly into very shoal water, or getting ashore, springing a leak, being struck by a squall while under sail, and losing a man overboard. Whenever a sudden demand is made upon a ship's company for putting forth their utmost energy and skill, much depends upon the example of the officers, and much on the normal state of discipline. If the officers have the skill and experience which only come with devotion to one's profession, and, retaining their self-possession, they issue their orders with decision, their example communicates itself to the crew, and order, even in the face of appalling danger, prevails. If the crew have been faithfully exercised at the various manœuvres likely to claim their attention, there is a ready and intelligent effort on the part of all to secure their common safety; or, in the last extremity, a steadfast purpose to meet their fate like men.

Inexperienced officers, and such as have made their profession a secondary consideration, and an undisciplined crew, are apt to be thrown into confusion at the very first alarm; panic ensues, and the danger is enhanced by misguided men seeking their personal safety, or misapplying their efforts.

An alarm of fire at sea is enough to appal the stoutest heart. To meet this emergency every ship has a regular fire-bill, in which each officer and man has his appropriate station and duty. The first step is to assemble the crew at quarters, where they are divided up into small groups of gun's crews under their proper officers. This prevents panic at once, and renders the crew more manageable. Every available pump is put in requisition; the hose are led out; a wrecking-party is supplied with axes, etc., and a smothering-party with wet blankets. Means are employed to prevent unnecessary currents of air; the ship's course is changed with reference to the wind, that the latter may be the least favorable for spreading the fire; the magazines are furnished with flood-cocks, by which they may be filled with water; sentries are posted over the boats to prevent their being lowered without orders. These means, particularly the use of the powerful steam-pumps of our modern ships, have been found adequate, while preserving the utmost order, to control any ordinary fire. The best preventive against panic is to be found in constantly drilling the crew at their stations, and from time to time by sounding false alarms when the crew are least prepared.

Should the fire gain the mastery, the boats are resorted to, a raft constructed of spare spars, provisions distributed, and the ship at the last moment abandoned. It is then that officers find their reward in the previous care bestowed upon the boats and their equipments. It is customary now to have a regular station-bill for "abandoning ship," and the crew exercised by it. The total loss by fire of the United States steam-frigate "Missouri," in the Bay of Gibraltar, in 1843, is a memorable example in point.

Collisions.—These generally occur in a fog, during the night, or in a crowded harbor. The Rules of the Road, as recently revised (which see), are sufficient to enable ships to avoid each other on all ordinary occasions. But there are times when it would seem as if no human care were sufficient to prevent collision.

The lights of one ship may be burning brightly, and yet, from some unsuspected cause, may be screened to the look-out of another vessel. This has no doubt led to many collisions at night. No rules will supply the want of careful attention to the running lights, the keeping of a good look-out, and the exercise of good judgment in the management of the ship. The running down and sinking of the United States steamer "Oneida," Commander E. P. Williams, United States navy, by the British mail steamer "Bombay," Capt. Eyre, January 23, 1870, by which 120 lives were lost, furnishes a melancholy illustration of this class of emergencies.

Getting on shore, or grounding, may sometimes happen even with the utmost care. The vessel may have been carried out of her course by unknown currents; continued fogs may have prevented observations of the sun; or, she may be brought up suddenly by some rock or shoal not laid down on the charts. Than this there are few emergencies at sea which make greater demands upon the skill, resources, energies, and endurance of both officers and crew. Sails must be instantly laid aback, or the engines reversed. Should this means fail, anchors must be sent out astern, a good strain be brought upon the cables, and the ship lightened, and hove off.

It is related that an English 64-gun ship having parted her cables in a gale, was drifting helplessly on shore, when the captain ordered the flood-cocks to be opened and the ship filled as much as possible with water. By this means the ship's draft was increased one foot before she took the bottom. On the return of good weather the water was pumped out, and the ship hove off.

Springing a leak, happily of rare occurrence

to a man-of-war, calls for prompt and intelligent action. In 1859 the Russian line-of-battle ship "Cæsarevitch," while cruising in the Mediterranean, sprung a leak. Cables and hawsers were passed round and round her, and hove taut to bind her together. She finally put into Malta for repairs, leaking so fast that her crew were well-nigh exhausted by their efforts to keep her afloat.

Eighteen hundred years before that, St. Paul, while at sea in a corn-ship of Alexandria, was caught in an equinoctial gale (A.D. September 23, 60), when the mariners were obliged to "undergird the ship," and subsequently to run her on shore on the same island,—Malta.

Struck by a squall while under sail calls for good seamanship on the part of the officer in charge of the deck. By putting the helm up the long ship of the present day is apt to go off far enough to bring the wind abeam, and stick there. This is a most dangerous position, and one to be avoided. The better plan is to keep a sharp look-out, and get the ship before the wind and under short canvas before the squall reaches you. If this is not practicable, then take your chances of luffing through it, reducing sail as speedily as possible. No written directions can possibly supply the place of good seamanship acquired in the school of practice. Even in this school close observation and reflection are essential. The one supplies mental pabulum; the other furnishes the digestive process by which the intellectual food is assimilated and converted into the very bone and fibre of the system.

Man overboard! Few alarms so startle "the little warlike world within" as this. Sympathy and curiosity impel every one to rush at once to the scene, and the direst confusion ensues. By making out a regular station-bill for a "man overboard," and by frequent false alarms, in which a buoy should be dropped and the life-boat lowered, the chances of panic, as with false alarms of fire, are reduced to a minimum.

In a steamer, the life-buoy must be dropped as near to the man overboard as possible, the engines stopped, the life-boat lowered, and the man picked up.

Sailing on a wind, a ship should be hove about, lowering the boat, and leaving the mainyard square, in stays. Going large with the yards well squared in, the ship should be rounded to, with head-yards aback, sail being reduced as expeditiously as possible.

The following points should be considered:

First, the quickest and most effectual means of checking the ship's way and keeping her as near the man as possible.

Secondly, to preserve order, enforce prompt obedience, and discourage fool-hardy volunteering.

Thirdly, to see that the life-boat is in all respects ready for use, and her crew at hand.

Fourthly, that the boat be not lowered with stern-board on.

Fifthly, to have persons stationed to keep the man in sight, and by motions to direct the course of the life-boat; at night to display a good light.

Finally, to insure success the officer in charge of the deck must be, in every sense, master of the situation.

Sailing in squadron, there is no alternative but to go about at once, and at night to display the position lights, to prevent your second astern from piling upon you. In the daytime there should be a preconcerted signal, by which the commander-in-chief, and the rest of the squadron, may know what has happened.

In the French signal-book there is a special rule laid down for this emergency.

In very bad weather, the question may present itself as to how far it would be justifiable to risk the lives of the seven or nine men of a boat's crew for the doubtful chances of saving one. In this conflict between feeling and discretion one's own judgment must decide.

The loss of, or injury to, a rudder is an emergency of rare occurrence in these days. On taking the ground, however, a ship may thump her rudder off; or, through defective workmanship or decayed wood, it may be lost in a gale, or it may be shot away in action.

The readiest and simplest substitute for a rudder is a hemp cable, or hawser, paid out over the stern, after the manner of a drag. To this are bent, well out from the ship, guys, of smaller hawsers, which are led in through blocks on either quarter. Heavy luffs are clapped on to the guys, and the ship steered by bringing the strain on either guy as may be required. Having made this temporary provision, a jury-rudder may be constructed on the plan proposed some years ago by Capt. Pakenham of the English navy. This consisted of a spare topmast, to form the rudder-stock, and other spare spars secured to it, and trimmed off in such lengths as to present, when boarded over, the general appearance of a rudder. A spare lower-cap serves as a gudgeon; the round hole embracing the topmast; the square one being cut away so as to be adjusted to the stern-post, where it is held in place by guys taken well forward and hard taut.

An order issued by the English Admiralty in 1840 required that ships should be furnished with a spare rudder-stock fitted with pintles. To the stern-post were fitted, while the ship was in dock, spare gudgeons. With these arrangements a jury-rudder could readily be constructed. In the event of wrenching off the rudder-head immediate resort would be had to the rudder-chains, which are kept for the purpose.

In regard to emergencies in general, the habit cannot be too often, or too earnestly recommended to officers placed in positions of responsibility, whether at sea or in port, of constantly presenting to themselves the various cases which might arise demanding their prompt and vigorous action.

By this method they school themselves for the hour of trial, and pass through any ordeal they may be subjected to with the glory of success.—*S. B. Luce, Captain U.S.N.*

Emersion. The reappearance of an occulted body.

Emmons, George F., Rear-Admiral U.S.N. Native of Vermont, from which State he was appointed midshipman, April 1, 1828; at Naval School, Brooklyn, N. Y., 1828; thence to steam-frigate "Fulton," in which he remained until she blew up, June 4, 1829; then in frigate "Brandywine," on special service to West Indies, 1830; and in Mediterranean, 1830–33.

Promoted to passed midshipman, July 14, 1834; brig "Consort," on our coast, 1836; bark "Pioneer," West Indies, 1837, carrying out Gen. Santa Anna, after his defeat in Texas; in

frigate "Macedonian" (as master) on our coast, 1837; joined the sloop-of-war "Peacock," and was commissioned as "lieutenant during the exploring expedition" of Capt. Wilkes, serving in her from 1838 to July, 1841, when she was lost on the bar at the mouth of Columbia River, Oregon.

Regularly commissioned as lieutenant, February 25, 1841; was occasionally in command of schooner "Flying-Fish," and while engaged in surveying and boat expeditions among the Pacific islands, was frequently engaged with the natives.

After the loss of the "Peacock," had charge of a party consisting of the scientific corps, officers, sailors, marines, and some hunters and trappers, to explore the country south of the Columbia to the head-waters of the Sacramento, and thence through California to San Francisco, where the party arrived, after several skirmishes with hostile natives, but without loss; in November, 1841, joined the "Vincennes," flag-ship of the Exploring Expedition, and came home in her *via* the East Indies, in 1842; receiving-ship and recruiting duty in Baltimore in 1843; in sloop-of-war "Boston" and frigate "Raritan," Brazil Squadron, in 1843–46; during the Mexican war, in the "Ohio"; 1847–48, in Gulf of Mexico, Brazil, and Pacific; was frequently employed on shore in Upper and Lower California, and once sent to the Sierra Nevada as bearer of dispatches to Gen. Mason; in sloop "Warren" and "Southampton," Pacific, in 1849; on bureau duty, Navy Department, Washington, 1851–52; in frigate "Savannah," Brazil Squadron, 1854–56; during the last year was in command of her as the flag-ship of Commodore Mercer.

Commissioned as commander, January 28, 1856; bureau duty and member of Light-House Board in 1861; during the Rebellion, was generally employed on blockade duty in the Gulf of Mexico and on the Mississippi River in command of the steamers "Hatteras," "R. R. Cuyler," "Monongahela," and "Brooklyn"; while in command of the first named captured Cedar Keys and Pass Christian, and some twenty prizes, nearly all of which were under English colors.

Commissioned as captain, February 7, 1863; was fleet-captain under Admiral Dahlgren, off Charleston, in 1863, while Fort Sumter was being reduced; afterward commanded the steam-sloop "Lackawanna" and a division of blockading vessels (from five to fifteen) in the Gulf of Mexico, to the close of the war; while commanding afloat at New Orleans, assisted in destroying the rebel ram "Webb" and capturing her officers and crew; upon two occasions successfully repelled and thwarted the attempts of the enemy to burn the shipping and city by fire-rafts and boats laden with hay and combustibles, whereby millions of property were saved; commanded the steam-sloop "Ossipee" to the Pacific and Alaska, in 1866–68, carrying thither our Commissioners and hoisting the American flag over our new possessions. During the return trip to San Francisco, the ship came near being lost in a hurricane which she encountered off Sitka.

Commissioned as commodore, September 20, 1868; appointed senior member of Ordnance Board in Washington, 1869, and subsequently given charge of the Hydrographic Office; commanding Naval Station, Philadelphia, 1870–72.

Commissioned as rear-admiral, November 5, 1872. Total sea service, 23 years; shore or other duty, 11 years. Retired August 23, 1873.

Emprise. An attempt or undertaking of danger; enterprise.

Emptions. Stores purchased.

Encircling Reef. A name given to a form of coral reef.

End for End. To shift an object *end for end* is to turn it through an angle of 180°. To shift a fall *end for end* is to reeve it the opposite way, so that the hauling part becomes the standing part.

End-on. Bow foremost; the opposite of *broadside-on.*

Enemy. In the military and naval sense, the opposing force.

Energy. The energy or *vis viva* of a shot is the amount of work stored up in it, and is expressed by the formula $\frac{w\, v^2}{32.16 \times 4880}$ = foot-tons of energy, w representing weight of shot, and v the velocity of impact.

The above formula classes projectiles in regard to their mashing or racking effect, but to find the punching effect the energy must be divided by the number of inches of the shot's circumference.

Enfield Rifle. A rifled musket which took its name from Enfield, in England, the place of its manufacture. It was, in the days of muzzle-loading small-arms, a serviceable and valuable weapon, but has now been superseded by arms of the breech-loading system.

Engagement. A battle or general action.

Engine. A machine for applying any of the mechanical powers or principles; especially a machine for applying steam to propel vessels, railroad trains, etc. See Marine Steam-engine.

Engine-bearer, or Engine-keelson. Strong timbers or girders, built in the bottom of a ship, on which the engines rest, and to which they are secured.

Engineer. One who plans structures or machines and superintends their construction, or surveys land or water for the location of structures. The term is applicable to those skilled in designing military or naval works, or machines of offense and defense, or in surveying and planning aqueducts, canals, railways, docks, etc.

One who is skilled in engineering, or the management of engines.

Engine-room. The space allotted to steam-engines and their appurtenances in ships or buildings.

Engine-room Telegraph. An electrical or mechanical device for communicating signals from the deck of a vessel to the engine-room. These signals may appear either in words, by sound of a gong, or by a combination of both.

Engineer, Civil. There are 10 civil engineers on the active list, one being stationed at each navy-yard and naval station.

The civil engineer supervises the erection and the repairs of all buildings, docks, and wharves in the navy-yards, and, if required to do so, of magazines, or other naval structures outside the yards. He has the immediate supervision and direction of the architect, when one is employed at the same yard with himself, and of all fore-

men and other workmen employed on said works, and recommends their respective wages, and is responsible for the proper distribution and employment of all materials for said work. He prepares plans of any proposed improvements, and estimates of cost, with bills of materials and schedules for advertisements, which may be necessary for such works. He supervises the inspection and measurement of all materials under his charge, and he is responsible for the waste or improper use of all material by those under his general supervision.

Engineer Corps. Though *engineer* is not a modern title in the military establishment, it is new to the navy.

The first officer of this name was placed on the official list of the British navy January, 1837, and the first appointment of an engineer in the navy of the United States was in 1836; but the corps was not regularly organized and incorporated in the navy register until 1843.

November 7, 1837, the Secretary of the Navy wrote Capt. M. C. Perry that the "Fulton" was allowed, as recommended by the Commissioners of the Navy and approved by the Navy Department,—

2 first-class engineers at $800 per annum each.

2 second-class engineers at $500 per annum each.

4 coal-heavers at $15 per month each.

8 firemen at $25 to $30 per month each.

This was the germ of the engineer corps of the U. S. navy, which at present consists of an active list of—

1 engineer-in-chief, having the relative rank of commodore.

9 chief engineers, having the relative rank of captain.

15 chief engineers, having the relative rank of commander.

45 chief engineers, having the relative rank of lieutenant-commander.

90 passed assistant engineers, having the relative rank of lieutenant.

6 passed assistant engineers, having the relative rank of master.

42 assistant engineers, having the relative rank of ensign.

54 cadet engineers, having the relative rank of cadet midshipman.

On the retired list there are 7 chief engineers, 18 passed assistant engineers, and 23 assistant engineers.

This increase, from 4 officers in 1837 to over 300 in 1880, shows the rapid development of steam as an adjunct in naval warfare. See Staff-officers.

Engineering, Bureau of Steam. This bureau directs the designing, running, and repairing of engines, boilers, and appurtenances afloat and at navy-yards and naval stations. The chief of the bureau is the engineer-in-chief and has the relative rank of commodore. See Navy Department.

Engineer-in-chief. See Engineering, Bureau of Steam.

Engineer, Fleet-. The senior chief engineer on a station is detailed to discharge the duties of engineer of the fleet. He is attached to the flagship, and his duties are as follows:

1. To exercise a general supervision over all the engineers of the fleet or squadron.

2. To acquaint himself with the different kinds of engines in use in the squadron, and to recommend the means to keep them in the highest state of efficiency.

3. To make quarterly inspections of machinery, and to decide upon all ordinary repairs. If alterations or additions to the machinery are proposed, a special report must be made, stating their probable cost and the time necessary for their execution.

4. To recommend surveys when imperfections or accidents are serious, and to make report where carelessness is known or suspected.

5. To see that every vessel is provided with the necessary tools, stores, and spare parts of machinery, and that every engine and boiler is properly cared for. As the strictest economy is required in the expenditure of stores, he will, previous to any of the vessels in the squadron leaving on detached service, see that they are provided with all that may be required in the engineer department, to prevent, as far as possible, any purchases while absent from the commander-in-chief, and he will make a report of the same to the commander-in-chief.

6. To examine the coal used, and report if there is any falling off in quality, or any undue dampness, and to see that it is properly stored at the depots, and that there is at all times a sufficient quantity on hand to meet the probable wants of the squadron.

7. To make frequent reports of the condition of the engineer department of every vessel in the squadron.

8. To examine all returns and requisitions made by the senior engineers of vessels, and to forward them, with such remarks as he may deem necessary.

9. To recommend such measures as will, in his opinion, promote efficiency, economy, and uniformity in his department.

10. And, finally, to perform such other duties, relating to his position, as shall be assigned him by the commander-in-chief.

Engineer, Chief. There are 70 chief engineers; the senior 10 have the relative rank of captain, the 15 next in seniority have the relative rank of commander, and the junior 45 have the relative rank of lieutenant-commander. See Engineer-in-chief.

When a chief engineer is attached to a navy-yard, he, under the direction of the commandant, has the superintendence of the construction and repair of the steam and other machinery. He has the supervision, under the commandant, of the foremen and all the men employed in the machine- and boiler-shops and foundries, and of the material used in those departments, and is responsible for its preservation and proper use. He has charge of all steam-machinery afloat, at the yard or station, under the direction of the commandant, whether the vessel be under repairs or in ordinary; and he is to exercise control over all employés in the engineer's department on board such vessels. When the vessel under repair is in commission, he will, before commencing any repair, confer with the commanding officer of the vessel, who will render him every facility for the prompt and economical execution of the work. He is responsible for the condition and preservation of all the machinery of the vessels under his charge. When a steamer

is to be laid up, he will take charge of the machinery at the time the chief engineer of the vessel is detached; when repairs are to be effected, he makes requisition on the commandant for the work necessary.

When a chief engineer is attached to a vessel he is in charge of the boilers and engines and their dependencies, distilling apparatus, steam-winches, engines for turning steam-capstans, etc. He keeps a strict account of the expenditures of coal, stores, and other articles in his department, and frequently examines the coal in the bunkers to see that there is no danger of spontaneous combustion.

Engineer, Assistant. When there is no chief engineer on board, the duties assigned to him devolve on the senior assistant engineer. Assistant engineers are at all times faithfully and zealously to carry into prompt execution all orders they may receive; and they are to be specially careful in the management of the engines, boilers, and their dependencies. When the engines are in operation, the engineer of the watch must execute promptly all orders he may receive from the officer of the deck, though he must be careful in so doing that no risk of injury is incurred. He reports hourly to the officer of the deck whether the engines and their dependencies, the force-pumps, hose, and all other means for extinguishing fire, are in good order, and that the pumps and hose are ready for immediate use. He notes hourly on the steam-log all the information which the columns in it require, and places in the column of "remarks" full information of the state of the weather and sea, and all accidents to, or defects in, the engines or their dependencies, the manner of their working, the quality of the coal, and any other circumstances which may be useful for determining the powers and qualities of the vessel and the engines under the various circumstances to which they may be exposed. He must be particularly careful to prevent the waste of coals, oil, tallow, and all other stores in the engineer's department.

Passed assistant engineers rank as lieutenant or master according to length of service; assistant engineers as master or ensign.

English, Earl, Commodore U.S.N. Born in New Jersey. Appointed from New Jersey, February 25, 1840; attached to frigate "Constellation," East India Squadron, 1840–44; steamship "Princeton," special service, 1844–45; Naval School, 1846.

Promoted to passed midshipman, July 11, 1846; razee "Independence," flag-ship, Pacific Squadron, 1846–48; present at capture of Mazatlan, 1847; steamer "Vixen," Home Squadron, 1849–50; store-ship "Southampton," Pacific Squadron, 1851–53; receiving-ship, Philadelphia, 1853; coast survey, 1854–55.

Promoted to master, 1855.

Commissioned as lieutenant, September 14, 1855; sloop "Levant," East India Squadron, 1855–58; took part in engagements with Barrier Forts, Canton River, China, November, 1856; navy-yard, Philadelphia, 1859; steam-sloop "Wyoming," Pacific Squadron, 1860–61; commanding steamer "Somerset," East Gulf Blockading Squadron, 1862; capture of fort at mouth of St. Mark's River, Florida, June 15, 1862.

Commissioned as lieutenant-commander, July 16, 1862; commanding steam-gunboat "Sagamore," East Gulf Blockading Squadron, 1863; captured and destroyed town of New Smyrna, Fla., July 28, 1863; commanding steam-gunboat "Pontiac," 1864; commanding steamer "Wyalusing," North Atlantic Blockading Squadron, 1864–65; capture of Plymouth, N. C., October, 1864; in action with rebel batteries and infantry, on Roanoke River, near Poplar Point, N. C., during the expedition up that river, the advance being prevented by torpedoes, December, 1864; ordnance duty, navy-yard, New York, 1866.

Commissioned as commander, July 25, 1866; commanding steam-sloop "Iroquois," Asiatic Squadron, 1867–69; commanding flag-ship "Delaware," Asiatic Fleet, 1870.

Commissioned captain, September 28, 1871; special duty, 1872; navy-yard, Portsmouth, N. H., 1873; commanding "Congress" (second-rate), European Station, 1873–76; navy-yard, Portsmouth, N. H., 1876–78.

In 1878 appointed chief of Bureau of Equipment and Recruiting.

Commissioned as commodore, 1880.

Enlarge. The wind is said to enlarge when it comes out nearer the stern.

Enlist. To enter upon a list; to enroll. Thus, the recruiting officer is said to enlist a man.

To enter into a contract with the government to serve it for a term of years in a naval or military capacity. Men are enlisted in the navy for a term of 3 years, and in the marine corps for 5 years. See Enlistment.

Enlistment. The act by which a man binds himself to serve the government for a term of years in a military or naval capacity. Recruiting officers are enjoined to guard against the enlistment of improper, unsound, or incompetent persons. Boys between the ages of 16 and 17 may be enlisted to serve in the navy until they reach the age of 21, but only with the consent of their parents or guardians given in a prescribed form. No person under 16, no insane or intoxicated person, and no deserter from the naval or military service shall be enlisted. No person shall be entered as landsman over the age of 25, unless he has some mechanical trade; nor after 34, even though he has a trade, without the authority of the Department. No person shall be entered as ordinary seaman unless he shall have been two years at sea; nor as seaman, unless he shall have been four years at sea before the mast, and have passed a satisfactory examination. The recruit is required to declare on oath, in presence of the commanding officer of the rendezvous or vessel, that he makes a true statement of his age, to the best of his knowledge and belief. Persons enlisted for general service shall not be detailed as servants for officers. Attendants selected by the officers themselves are enlisted for the cruise, and are not to be turned over to the general service. After selection these men must be retained as attendants until discharged.

Ensign. The lowest grade of commissioned officers in the navy, corresponding to the grade of second lieutenant in the army. An ensign is a steerage officer, and may be ordered to duty on the forecastle, in the fire-room, or to any other duty at the discretion of the commanding officer. When assigned permanently to duty as a watch- and division-officer he is entitled to quarters in the wardroom. This title was first introduced

into the U. S. navy in 1862, taking the place of the title of Passed Midshipman, and these officers now continue the duties of the latter.

Ensign. The national flag. (See COLORS.) It is almost invariably hoisted at the peak of American vessels, but English men-of-war generally hoist their ensign to a staff at the stern when in port. See FLAG.

Entering-ladder. See ACCOMMODATION LADDER, JACOB'S LADDER.

Entering-port. In three-deckers, a port cut down to the level of the deck on the middle deck.

Entering-rope. A man-rope over the side at the gangway.

Entrance. The angle which the bow of a ship makes with the water at the line of flotation.

Entrance-money, or Entrance-fee. A payment made for mess-furniture, stores, etc., on joining a mess.

Epact (Gr. *epagein*, to add in). The number indicating the days and parts of a day to be added to the lunar year of 12 lunar months to make it up to the solar year; this number is the age of the moon at the commencement of the calendar year. A mean lunation is $29^d\ 12^h\ 44^m$; the moon, therefore, describes in 365 days 12 complete lunations and $10^d\ 15^h$ of the thirteenth; hence on the first of January its age is $10^d\ 15^h$ more than on the preceding first of January, and $11^d\ 15^h$ if the preceding year was a leap-year.

The *epact for the year* is the moon's age on the first of January; the *epact for the month* is the moon's age on the first of the month, supposing the moon to change at noon January 1st.

Epaulet. A shoulder ornament. See UNIFORM.

Ephemeris, The Astronomical. Works on astronomical bibliography mention *ephemerides* as early as the 12th century. The earliest printed ephemerides are those of Johann Regiomontanus, published in the latter part of the 15th century. They included only the predictions of eclipses and positions of the planets, and sold for much more than their weight in gold. The earliest astronomical ephemeris appearing year by year is the *Connaissance des Temps ou des Mouvements Celestes*, which has not suffered interruption since the publication of the first volume, by Picard, for the year 1679. Since 1795, the work has been under the direction of the *Bureau des Longitudes*, established in that year. It is issued two years in advance of date. Each volume contains a very full *Table des Positions Géographiques*, data not conveniently accessible elsewhere. Detailed improvements were introduced into the volumes for the years 1862 and 1863, whereby the *Connaissance des Temps* was placed on equal footing with the ephemerides of other nations. One marked difference between it and similar publications consists in the omission of the Calendar, proper,—the several ephemerides being arranged according to the objects to which they pertain, and not according to the months of the year. The first volume of the astronomical ephemeris of England may be said to be that for the year 1834. The British Nautical Almanac, however, had then long been a regular publication,—the first volume was that for the year 1767 (see ALMANAC, THE NAUTICAL); but the ephemerides for the special use of the astronomer had always occupied a secondary position. In addition to the important change from apparent to mean time in the computations of the Almanac, the Report of the Committee Relative to the Improvement of the Nautical Almanac recommended, among other things, an extension of the ephemeris of Jupiter's satellites, the insertion of a list of moon-culminating stars, apparent places of fixed stars for upper transit at Greenwich (instead of, as previously, for noon), and the insertion of a table for determination of latitude by Polaris at any time. Almost no important differences of arrangement are to be remarked between the British Nautical Almanac for 1834 and that for 1883,—the latest issued. An unparalleled circumstance in the history of nautical almanacs occurs in the British Nautical Almanac for 1882, wherein the positions of the sun and the major planets are all predicted from one uniform series of tables,—those by the late Le Verrier, of Paris. The *Berliner Astronomisches Jahrbuch* (Berlin Astronomical Annual) is among the oldest of the national ephemerides; the first volume was that for the year 1776. It is published two years in advance of date, and is marked by a lack of design for the use of navigators; being gotten up almost solely with reference to astronomical convenience. One characteristic feature consists in the great amount of space devoted to ephemerides of minor planets, which now number about 220 (June, 1880). Spain publishes one year in advance its *Almanaque Náutico*, computed for the meridian of San Fernando. It does not need especial notice, except that nearly all the data of prediction are embraced under the Calendar scheme, thus making it the counterpart of the *Connaissance des Temps*. The Portuguese publish, two years in advance, the *Ephemerides Astronomicas*, computed for the meridian of Coimbra. It is very similar to the *Almanaque Náutico* of the Spanish, both in general arrangement and amount of data, except that it gives no apparent positions of fixed stars. The Italian *Effemeridi Astronomiche di Milano* ranks among the oldest astronomical ephemerides, the initial volume being that for the year 1755. The data of prediction which it contains are mostly for the use of astronomers, only. A good share of the space in many of the volumes is given up to astronomical memoirs and meteorological observations. In treating of the American ephemeris, we shall have to do principally with that portion which is designed quite exclusively for astronomical use, and is adapted to the meridian of Washington. No radical changes ever having been made in the general principles of its construction, we shall take the volume for 1883, now in press, for a descriptive specimen. In addition to the ephemerides of the sun and moon, the lunar distances and ephemerides of the most conspicuous planets, contained in the navigator's portion of the volume, the American Ephemeris and Nautical Almanac contains the heliocentric positions of the major planets, with the logarithms of their distances from the sun and from the earth; the rectangular equatorial co-ordinates of the sun; the longitude and latitude of the moon; data for the libration of the moon; the aberration and parallax of the sun; formulæ and numbers for reducing a star from its mean to its apparent place or the reverse; special ephemerides for easy reduction

of observations of the moon and major planets; very full data, with maps, of the eclipses; data for the prediction of occultations of planets and stars by the moon; phenomena and configurations of the satellites of Jupiter, and data for identifying all known satellites of the other planets; the longitude and latitude of about 140 observatories; an article on the arrangement and use of the American Ephemeris and Nautical Almanac; an appendix on the construction of the same; and a selection of tables much used in astronomy and navigation. The astronomical tables by which the American Ephemeris and Nautical Almanac is prepared are as follows: the ephemerides of the sun and moon are from Hansen's Tables; Mercury, from Winlock's Tables; Venus, from Hill's Tables; Mars, from Lindenau's Tables, with corrections; Jupiter, from Bouvard's Tables, with corrections; Jupiter's satellites, from Damoiseau's Tables, supplemented by those of Todd; Saturn, from Bouvard's Tables, with corrections; Uranus and Neptune, from Newcomb's Tables.—*D. P. Todd.*

Epoch. A point of time rendered conspicuous by some historical event; era; period; date.

Eprouvette. A small piece of ordnance for testing the force of gunpowder.

Equal Altitudes. See ALTITUDE.

Equation of Equal Altitudes. See ALTITUDE.

Equation of Second Differences. See DIFFERENCES, SECOND.

Equation of Time. The difference between apparent and mean time. In consequence of the motion of the sun in the ecliptic being variable, and the ecliptic not being perpendicular to the axis of the earth's rotation, apparent time is variable, and this fluctuation is considerable, amounting to upwards of half an hour,—apparent noon sometimes taking place as much as $16\frac{1}{4}^{m}$ before mean noon, and at others as much as $14\frac{1}{2}^{m}$ after. These are the greatest values of the equation of time; it vanishes altogether four times in the year,—this occurring about April 15, June 15, September 1, and December 24. It is calculated and inserted in the Nautical Almanac for every day in the year. The equation of time is itself a portion of mean time.

Equator (Lat. *æquare*, to divide into equal parts). The *terrestrial equator* is that great circle of the earth whose plane is perpendicular to the axis of the earth, and consequently every point of which is equidistant from the north and south poles. It divides the globe into the northern and southern hemispheres. The equator is the primitive circle in the system of co-ordinates used for defining the position of places on the earth's surface. Origin, intersection of the equator by the first meridian; co-ordinates, longitude and latitude.

The *celestial equator* is the great circle in which, if the terrestrial equator were extended indefinitely, it would intersect the celestial sphere. It is also called the *equinoctial*, and is the primitive circle in a system of co-ordinates used for defining the position of points on the celestial sphere. Origin, first point of Aries; co-ordinates, right ascension and declination.

EQUATORIAL CURRENT. The set, chiefly westerly, met with near the equator, especially in the Atlantic.

EQUATORIAL PROJECTION OF A SPHERE. A projection in which the primitive plane or plane of projection is parallel to, or coincides with, the equator.

EQUATORIAL SECTOR. An instrument for finding the difference in the right ascension and declination of two heavenly bodies.

EQUATORIAL TELESCOPE. A telescope so mounted that it enables the observer to follow the stars as they move equatorially.

Equiangular Spiral. A line which cuts the meridians at a constant angle; a rhumb-line; a loxodromic curve.

Equilibrium-valve. A valve for equalizing the pressure of a fluid or fluids contained in two separate chambers or vessels. The term, though objectionable, is sometimes applied to the main steam- and exhaust-valves of an engine when they are "balanced," or so arranged that difference in pressure between the boiler steam and discharged steam will not offer resistance to the movement of the valve. "Double poppet-valves," "D-valves," and "ring" or "piston-balanced" plain slide-valves are examples.

Equinoxes (Lat. *æquus*, equal; *nox*, night). The two periods of the year, about the 21st of March and the 23d of September, when the sun, in his annual revolution in the ecliptic, crosses the equinoctial. At these times the days and nights are of equal length throughout the world, hence the term. The two equinoxes are distinguished as the *vernal equinox* and *autumnal equinox;* the former being that when the sun passes from the southern to the northern hemisphere, the season being "spring" in the northern hemisphere; the latter, when the sun passes from the northern to the southern hemisphere, the season being "autumn" in the northern hemisphere. These terms are relative; for what are the vernal and autumnal equinoxes for the northern are respectively the autumnal and vernal equinoxes for the southern hemisphere. In cases where there is any danger of ambiguity or confusion, we may add the qualifying adjectives "northern" or "southern," as the case may be; thus, one date would be called the *northern vernal equinox* or the *southern autumnal equinox*, and the other the *northern autumnal equinox* or the *southern vernal equinox*. It is convenient to restrict the term *equinox* to indicate a *date* or epoch of *time;* and to use the expression, *equinoctial point*, when we want to refer to a *position* or *place* in the ecliptic. Similarly for *solstice* and *solstitial point*.

EQUINOCTIAL. The celestial equator. The name is derived from the fact that at all places on the surface of the earth beneath this circle the nights are equal all the year round, being of the constant length of 12 hours. The equinoctial is the primitive circle in a system of co-ordinates for defining points on the celestial sphere. Origin, first point of Aries; co-ordinates, right ascension and declination.

EQUINOCTIAL COLURE. The hour-circle which passes through the equinoctial points. In the polar co-ordinates for the celestial sphere, it is the initial position of the secondary circles. See COLURES.

EQUINOCTIAL GALES. Storms which occur about the time the sun crosses the equinoctial.

EQUINOCTIAL POINTS. The two points of the ecliptic in which it is intersected by the equinoctial. They are distinguished as the *vernal equi-*

noctial point and the *autumnal equinoctial point*, but are more generally called the *first point of Aries* and the *first point of Libra*, as being the commencement respectively of these signs of the ecliptic, and they are represented by their symbols ♈ and ♎. The constellations of Aries and Libra, though not now coincident in position with them, give their names to these divisions of the ecliptic, and the figure of the *Balance* (Libra) has evident reference to the equipoise of the day and night at the equinox. The first point of Aries is the origin or zero point, from which right ascensions are reckoned on the equinoctial and longitudes on the ecliptic. The equinoctial points do not, however, preserve a constant place among the stars, but travel backwards along the ecliptic,—*i.e.*, from east to west, or contrary to that in which the sun appears to move in that circle. This retrogression is extremely small, amounting to 50.1″ annually, so that a complete revolution occupies 25,868 years. It is, however, of great inconvenience to practical astronomers, as it renders obsolete, from time to time, their catalogues of the stars, which are referred to this shifting vernal equinoctial point as origin. Since the formation of the earliest catalogues on record, the place of the first point of Aries has retrograded about 30°, altering to this extent the longitudes. The technical phrase for the phenomenon is the *precession of the equinoxes*,—a term derived from the fact that the epoch of the equinox every year "precedes," or is earlier than it would have been but for the retrogression of the first point of Aries.

Equip. To supply with all the articles necessary for efficient service. To fit out.

Equipment. The act of fitting out or furnishing an individual, vessel, or force with all the essential requirements for efficient action. Also, the collective designation of the articles comprising the outfit.

Equipment and Recruiting, Bureau of, is that branch of the Navy Department which has charge of the equipment of all vessels of war, the supply of their sails, rigging, anchors, and fuel; also the recruiting of sailors of the various grades for the navy. See Navy Department.

Equipment Officer. The captain of the yard is the head of the department of equipment in the yard, and discharges the duties of that position in addition to his other duties. The executive-officer is the equipment officer of a ship, and is responsible for all articles and stores in that department.

Equuleus. See Constellation.

Erichthus. A genus of long-tailed decapod crustaceans, inhabiting tropical seas.

Ericsson, John, LL.D. Born in the province of Vermeland, Sweden, 1803. At the age of 11, Count Platin gave him a cadetship in a corps of engineers; and in 1816 he was employed on the grand ship canal between the Baltic and the North Sea. He entered the Swedish army as ensign, rose to the grade of lieutenant, and was for some time employed in the survey of Northern Sweden. One of the earliest of his inventions was the flame-engine, intended to work independently of steam by condensing flame. Visiting England in 1826, he discovered that this engine when worked by mineral fuel was a total failure. Devoting himself to mechanical pursuits, he invented the steam-boiler on the principle of artificial draft. In 1829 he competed for the prize offered by the Liverpool and Manchester Railway for the best locomotive, and produced an engine that attained the then incredible speed of fifty miles an hour. This led him to construct a steam fire-engine with entire success. Directing his attention to navigation, he invented the propeller, and that new arrangement of the steam-machinery in ships of war which has revolutionized the navies of the world. Not succeeding in making the British Admiralty believe what they saw, he came in 1839 to New York, and in 1841 was employed in the construction of the U. S. ship of war "Princeton," on the very plan which had been received with such indifference by the British Admiralty. She was the first steamship ever built with the propelling machinery under the water-line, and out of the reach of shot; and she was distinguished for numerous other mechanical novelties. In 1852 he was made Knight of the order of Vasa by King Oscar of Sweden. The same year he brought out a new form of caloric-engine in the ship "Ericsson." In the American department of the great exhibition of 1851 he exhibited an instrument for measuring distances at sea, the hydrostatic gauge for measuring the volume of fluids under pressure, the reciprocating fluid-meter, the alarm barometer, the pyrometer, the rotary fluid-meter, and the sea-lead, of all of which instruments he has given a brief explanation in a pamphlet published in 1851. For these he received the prize medal of the exhibition. Ericsson's caloric-engine was first placed before the scientific in London in 1833. Its advantages over steam are economy of space, economy of first cost, economy of fuel, of repairs, and running expenses, simplicity, safety, and power. His great invention—the ironclad "Monitor"—had just been completed, and arrived at Fortress Monroe most opportunely, March 9, 1862, to stay the devastating progress of the rebel ironclad "Merrimac." The result of this contest settled the question of "wooden navies." Capt. Ericsson was the first to bring the system of iron turret-ships into operation.

Eridanus (the river *Eridanus*, the Po). A winding constellation in the southern hemisphere, containing one star of the first magnitude. *α Eridani*, called also *Achernar*, may be found by bisecting the line joining Fomalhaut and Canopus.

Erie. A city and port of entry, on Lake Erie, 88 miles S.W. of Buffalo, 95 miles E.N.E. of Cleveland. Lat. 42° 8′ N.; lon. 80° 8′ W. It has a safe land-locked harbor, which is 4 miles long by 1 mile wide, and is protected by the island of Presque Isle, on which two light-houses are situated. Pop. 27,000.

Erigone. A name sometimes applied to the constellation Virgo.

Erne. See Earne.

Escape-valve. A weighted or constrained valve, so arranged as to permit the escape of a fluid from a chamber when the pressure exceeds a desired tension. See Safety-valve and Cylinder Escape-valve.

Escutcheon. The space on the stern of a ship where her name is painted.

Eskippamentum. An archaism for a ship's furniture (Anglo-Norman, *eskipper*, to ship).

Eskippeson. An old law-term for a passage by sea. See ESKIPPAMENTUM.

Esnecca. A royal yacht of the 12th century. A transport of the middle ages.

Esox. A genus of abdominal fishes, including the pike.

Espials. An old term for night-watches afloat, in docks and harbors.

Esquimalt. A seaport of British Columbia, on Vancouver Island, on the Strait of Juan de Fuca, 65 miles from its entrance, and 3 miles S.W. of Victoria. The harbor is very extensive, and vessels of the largest size can anchor here in safety. Esquimalt is destined apparently, in connection with the Canada Pacific Railway, to be the future entrepôt of a national commerce. Here are situated a navy-yard, a hospital, and other necessary buildings for the requirements of a squadron, as the town is the station of her Majesty's ships of a portion of the Pacific squadron.

Esquimaux. A name derived from *esquimantsic*, in the Abenaki language, meaning *eaters of raw flesh.* Many tribes in the Arctic regions are ignorant of the art of cookery.

Establishments, Naval, of Great Britain. The dock-yards of Great Britain are situated at Chatham, Sheerness, Portsmouth, Devonport, and Pembroke. There are victualing-yards at Deptford, Gosport, and Haulbowline, near Cork, Ireland. In her colonies, Great Britain has fine dock-yards at Bermuda, Malta, and Halifax, besides store-ships or store-houses at most of the principal ports.

Chatham is situated on the Medway River, 30 miles E.S.E. from London. In addition to having the School of Military Engineering and the Marine Infirmary, it possesses a fine dock-yard, which is a mile in length, containing several ship-building slips and dry-docks sufficiently capacious for the largest ships. It has also basins for the vessels of the Steam Reserve, which is a term applied to the vessels forming the list in ordinary. It has a metal-mill, which supplies the other dock-yards with copper sheets, copper bolts, and other articles in copper and mixed metals. It has also extensive saw-mills, the largest rope-walk in the kingdom, and all scrap-iron is sent to Chatham to be melted and rolled into required shapes. It has also a machine for testing the strength of chain-cables, and block-making machines. The dock-yard has a rear-admiral-superintendent in command, and employs 2000 hands.

Sheerness is situated on the northwest extremity of the Isle of Sheppey, at the confluence of the Thames and Medway, 11 miles E.N.E. of Chatham. It has a fine dock-yard covering over 60 acres, has immense store-houses, several dry-docks and basins. It is under the control of a captain-superintendent, and with Chatham comes under the command of the commander-in-chief at the Nore.

Portsmouth is the chief naval arsenal of Great Britain, and is situated on the southwest side of Portsea Island, at the entrance of Portsmouth harbor, and opposite the town of Gosport. It is 74 miles S.W. from London. The dock-yard has an area of 300 acres; it has basins capable of holding all the vessels of the British navy; has also a dozen dry-docks, and a large deep sea-dock over 600 feet long and 60 feet in depth. It has also a torpedo-ship for the instruction of officers in torpedo warfare, and a gunnery-ship for instruction in gunnery. The dock-yard also contains mast- and rope-houses, hemp-stores, rigging-stores, and sail-loft. It has various ship-building slips. The wood-mills contain a number of block-making machines. The harbor is 420 yards wide at its entrance, and is defended by forts on each side. It expands into a spacious basin, extending inland for 4 miles, forming Porchester Lake. Large war-vessels can enter and lie at anchor at all times of the tide, and in the stream above the dock-yard are moored several hulks of vessels which bear names that they have rendered historical. The "Victory," Lord Nelson's flag-ship at the battle of Trafalgar, is kept here in commission, and is open to the general public. The dock-yard is under the control of a rear-admiral-superintendent, and the naval station, comprising Spithead and Gosport as well, is under the general command of the naval commander-in-chief. The importance of this port dates from the reign of Henry VIII.

Haslar Hospital, near Gosport, is one of the largest naval hospitals in Great Britain.

Devonport is two miles W.N.W. of Plymouth, and contains a large dock-yard of 358 acres in extent. The yard is situated on the Hamoaze, an estuary of the Tamar. It contains six building-slips for vessels and five dry-docks. It is the principal yard for sail-making, rope-making, and the manufacture of anchors. It employs about 2500 hands; is controlled by a rear-admiral-superintendent, and the station at Plymouth is under command of a naval commander-in-chief.

Pembroke, situated in South Wales, on a navigable creek of Milford Haven, is 7 miles S.E. of Milford. Pembroke dock is 2 miles from the town. It has twelve building-slips and dry-docks. The entire naval establishment covers an area of over 80 acres. It is principally a ship-building yard, and owes its naval importance to that fact.

The British government does not confine its ship-building entirely to the dock-yards, but employs, when required, the services of private ship-builders.

Deptford, which is now a victualing-yard, is situated in the town of that name, about 4 miles below London bridge, and opposite Greenwich. It has five building-slips and two dry-docks, but they are not much used now, as it is principally a fitting-out yard. It is the chief station for victualing the foreign and home stations, also for the small stores and clothing for the navy and marines, which are here inspected, packed, and issued to the naval service.

At Gosport, opposite Portsmouth, is the Royal Clarence Victualing-Yard, where the bread used in the British navy is made. It has extensive bakeries, etc.

At Haulbowline, near Cork, is also a victualing-yard, similar to, but not so extensive as, Deptford.

At Dartmouth, Devon, on the south coast of England, is the training-ship "Britannia" for the naval cadets.

At Chatham, Portsmouth, and Devonport are extensive barracks for the marines when not on service afloat.

Establishment of the Port. See TIDE.

Estuary. An inlet of the sea; the widening of the mouth of a river into an arm of the sea.

Esture. An old word for the rise and fall of water.

Etesian Winds. The *Etesiæ* of the ancients; winds which blow constantly, in the Levant, during the time of the dog-days.

Etiquette, Naval. Naval ceremonies; customs of the service.

Euphroe. A block of wood to extend the small lines called a *crow-foot.*

Evaporation. Vapor is any substance in a gaseous condition, at the maximum density consistent with that condition. It is certain that most substances are volatile, and do exist in a state of vapor at all attainable temperatures. Iron, copper, lead, and tin are examples in which this is obvious to the smell.

When a body passes from a solid or liquid to a gaseous state, the *work* necessary to separate the atoms requires a certain quantity of *heat* for each unit of weight of the substance evaporated, which is dependent on the temperature of the *boiling-point,* and remains constant for any constant pressure of the vapor produced without being sensible to the thermometer. This is called the *latent heat of evaporation.* The *total heat of evaporation* is the sum of the *latent heat,* and the heat required to raise the temperature before evaporation from some fixed temperature to that of evaporation. When a vapor is condensed an action reverse to that of evaporation takes place.

Regnault's experiments, the most extensive and accurate known, show that the latent heat of evaporation of pure water at the atmospheric pressure of 14.7 pounds per square inch is 966.1° F. The *boiling-point* is 212° F., and the *total heat* from the temperature of melting ice, 1146.1° F.

Eve-eel. A name for the conger-eel,—from the Danish *hav-aal,* or sea-eel.

Evening Gun. The gun fired at tattoo.

Even Keel. A ship so trimmed as to draw the same water forward as she does aft is on an *even keel.*

Evolution. A manœuvre of a fleet, vessel, or body of men.

Ewage. An old law-term for the toll paid for a water-passage.

Examinations. Boards are ordered for the examination of candidates for appointment or promotion, the latter being duly informed of the time and place of meeting. Before proceeding to the examination of any candidate for appointment, the medical officers furnish to the board a certificate of the physical fitness of the candidate. No person will be passed by the medical board who is not free from physical defects and all obvious tendency to any form of disease which would be likely to interfere with an efficient discharge of duty. In the case of an assistant surgeon, the board scrutinizes his physical qualifications, and makes a separate report in each case direct to the Department. The board to examine professionally, having received the certificate of the physical fitness of the candidate, examines him on all the required qualifications; it grants certificates to those who may be found duly qualified, numbering them in the order of merit; it also reports to the authority convening the board, at the close of a session, the result of all its investigations, and forwards the documentary evidence it may have received in relation to the capacity and fitness of those examined.

Applications for admission into the navy can be made to the Secretary of the Navy at any time by the candidate himself, or by his parent, guardian, or friends. All applications must state age, birthplace, and residence of the candidate, who must also furnish certificates of moral and physical qualifications. No person will be appointed an officer in the navy until he shall have passed a physical and a professional examination.

Any person giving a false certificate of age, character, or time of service, or making a false statement to a board of examination, will be dropped.

A candidate for an appointment to the grade of assistant engineer must be not less than 19 nor more than 26 years of age; [illegible]ave had not less than two years' service in [illegible] and fabricating and management of steam-[illegible]nd by for marine purposes, and must give sa[illegible]en to evidence of his skill in such capacity, or [illegible]hem served not less than that period as an engin[illegible]nd on board of a steamer provided with a conde[illegible]b-sing-engine, and have a certificate from the director or superintending engineer as to [illegible] ability.

He will be examined in accordance with the forms prescribed by the Navy Department.

A candidate for the office of assistant naval constructor must be not less than 24 nor more than 30 years of age; must furnish evidence showing that he is a shipwright by profession, that he has been engaged in that business, and must present the certificate of the person with whom the business was learned, and will be required to pass such examination as the Navy Department may direct.

A candidate for the office of assistant paymaster must be not less than 21 nor more than 26 years of age. His moral and mental qualifications will be subjects of rigid investigation by a board.

A candidate for the office of assistant surgeon must be not less than 21 nor more than 26 years of age. His moral, mental, and professional qualifications will be decided upon by a board.

An applicant for the office of chaplain must be not less than 21 nor more than 30 years of age. He must be a regularly-ordained minister.

A candidate for a boatswain's appointment must be of correct habits, not less than 21 nor more than 35 years of age; he must have been at least seven years at sea, and have served at least one year as a petty officer; he must be a thorough practical seaman, and understand cutting, fitting, and rigging according to regulations, the weighing, catting, fishing, securing, and transportation of anchors and the working of cables, the erection and securing of sheers, the handling of purchases, masting, securing yards, etc., and be able to write sufficiently to keep an account of stores.

A candidate for the appointment of acting gunner must be a seaman of sober and correct habits, not less than 21 nor more than 30 years of age. He must understand the manner of fitting magazines and shell-rooms; the manner of stowing and preserving powder, projectiles, fireworks, and all ordnance-stores afloat and on shore; also the manner of handling and secur-

ing guns. He must be able to put up all kinds of ammunition, to take impressions of vent and bore, to star-gauge guns, to adjust, verify, and use sights, and to fit all gun-gear. He must understand and be able to explain all fuzes in use in the navy, and be conversant with orders and regulations in regard to the care and handling of all ordnance material, afloat or ashore, and with the charges of powder for guns and projectiles of every calibre. He must be able to read and write with facility, understand the first four rules of arithmetic and proportion; be able to keep the gunner's accounts correctly, and he must have made a cruise in a sea-going vessel of war.

A candidate for a carpenter's appointment must be of correct habits; be not less than 21 nor more than 30 years of age; be a good ship-squadr, understand calking, the fishing of masts jesty'yards, and the quality and strength of tim-Es how to unship and hang a rudder, to con-manuct and hang a jury-rudder, and be able to eatrite sufficiently well to keep an account of regores.

A candidate for a sailmaker's appointment must be of correct habits; be not less than 21 nor more than 30 years of age; be a good workman; be capable of draughting, and understand thoroughly the cutting and making of sails, awnings, hammock-cloths, boom-covers, and wind-sails, and be able to write sufficiently well to keep an account of stores.

No acting gunner will receive a warrant as gunner until, after making a cruise of not less than one year as acting gunner in a sea-going vessel, and after a course of laboratory instruction at the Washington Navy-Yard, he has passed a thorough examination before a board of line-officers. He will not be entitled to examination unless he presents commendatory letters from his commanding officers. An acting boatswain, carpenter, or sailmaker is eligible for a warrant bearing the same date as his acting appointment after serving one year at sea: provided the commanding officers under whom he has served have certified favorably as to his merits.

Boards for the examination of candidates for appointment or promotion are composed as follows: for a mate, boatswain, gunner, carpenter, or sailmaker, of three line-officers, one of whom shall be of or above the rank of lieutenant-commander; for engineer officers, of three chief engineers; for passed assistant and assistant paymasters, of three paymasters; for assistant naval constructors, of three naval constructors. See NAVAL ACADEMIES, RECRUITING.

Examination of Officers for Promotion and Retirement in the Navy, Board of. Officers of the medical corps were first subject by statutory law to examination before promotion to a higher grade by a board of surgeons, designated for the purpose by the Secretary of the Navy. The act requiring the examination of this class of officers was approved May 24, 1824.

The subsequent legislation of Congress on this subject, as expressed in the acts approved respectively July 16, 1862, and April 21, 1864, require "all officers below the grade of commodore, and all officers not of the line," and "in time of peace all officers to be promoted from the list of commodores to the grade of rear-admiral," to be examined as to their physical qualifications to perform the duties of a naval officer at sea by a board of medical officers, appointed for the purpose by the Secretary of the Navy. An exception is made in cases of officers whose physical disqualifications were occasioned by wounds received in the line of duty, which do not incapacitate them for other duties in the grade to which they shall be promoted.

In addition to the physical examination herein stated, the officers aforesaid are required to establish their mental, moral, and professional fitness for promotion to the satisfaction of a board of examining officers appointed by the President of the United States. Said board to consist of not less than three officers, senior in rank to the officer to be examined.

The officers thus subject to examination before promotion, to a grade limited in number by law, are not entitled to examination in such a sense as to give increase of pay, until designated by the Secretary of the Navy to fill vacancies in the higher grade.

When such vacancies occur, and the officers are designated to fill the same, the law says that "any such officer whose case is to be acted upon by such examining board shall have the right to be present if he so desires, and to submit a statement of his case on oath."

The peculiar wording of this section of the law has occasioned different opinions as to its meaning. Some officers have questioned the right of such examining board to personally interrogate officers who appear before it as candidates for promotion, and have claimed that the law leaves it optional with the candidates to be present or absent, as they may elect.

Upon full examination of the law, and after mature deliberation as to its interpretation, it has been decided by the revising authority that such right exists, and that the law creating such examining boards, and such candidates for examination, implies without question the right on the part of the former to interrogate, and the duty on the part of the latter to answer.

The right of personal examination is therefore the fundamental principle of these boards, and indispensable primarily to the accomplishment of their objects, and this power may not be restrained or limited except by express affirmative legislation.

In addition to this right of personal examination, the law confers upon these boards all needful and convenient power of further collateral examination, such as to summon, swear, and examine witnesses, and to inspect the files of the Navy Department; and those powers are exercised in such forms of procedure and report as will enable the President of the United States, who is the revising authority, to see and understand fully all the facts necessary or desirable for his consideration.

The boards are organized anew in each case, and sworn in the presence and hearing of the candidate to be examined.

The record of the proceedings in each case is made up with precision and care, and with scrupulous attention to legal requisites, and is signed by every member and the recorder, and shows who of the members concurred in, and who, if any, dissented from the opinion of the board.

The requisite mental, moral, and professional qualifications, to be determined by the examina-

tions, relate to the duties and responsibilities of the grade to which the candidate seeks promotion, and not to those of any other grade.

No officer may be rejected until after such public examination of himself, and the records of the Department in his case, unless he shall fail to appear before the board after having been duly notified.

Whenever any officer of the navy, on being ordered to perform the duties appropriate to his commission, shall report himself unable to comply with such order, or whenever, in the judgment of the President of the United States, an officer of the navy is in any way incapacitated from performing the duties of his office, the President, at his discretion, directs the Secretary of the Navy to refer the case of such officer to a board of not less than five commissioned officers, two-fifths of whom are members of the medical corps of the navy; the members of the board, except those taken from the medical corps, are senior in rank to the officer to be examined.

The board is authorized to inquire into, and determine the facts, touching the nature and occasion of the disability of any such officer; and has such powers of a court-martial and of a court of inquiry as may be necessary.

The members are sworn in each case to discharge their duties honestly and impartially.

When the board finds an officer incapacitated for active service, from wounds, or injury received in the line of duty, from sickness or exposure therein, or from any other incident of the service, and the President approve of such finding, the disabled officer is thereupon placed upon the list of retired officers with pay equal to seventy-five per centum of the sea-pay for the grade or rank he may hold at the date of his retirement.

But if such disability or incompetency proceeded from other causes, and the President concur in opinion with the board, the officer is retired upon furlough-pay, or he is wholly retired from the service with one year's pay, at the discretion of the President; in this last case his name is wholly omitted from the navy register.

No officer of the navy may be retired because of misconduct, but he is subject to court-martial for such misconduct.

The members of the board are sworn in each case to an honest and impartial discharge of their duties; and no officer of the navy may be retired, either partially or wholly from the service, without having had a fair and full hearing before the board, if he shall demand it, except in cases where he may be retired by the President, at his own request, or on account of age, or length of service, or on account of his failure to be recommended by an examining board for promotion.—*James C. Dulin.*

Exchequered (*Eng.*). Seized by government officers as contraband.

Executive-officer. The title of "executive-officer" is of quite recent date, and has been the cause of much discussion, bad temper, and bitter opposition; it has grown from the ashes of the old *first lieutenant*, and finds its parallel in the army adjutant, and in all corporations or factories employing large bodies of men, in the name of superintendent or manager. The executive-officer holds by far the most onerous, most difficult, and most thankless office on board ship, while his authority is limited entirely by the dictum of his commander. His duties consist in stationing the officers and crew for the necessary handling of the sails and spars, in the boats, at the great guns, fire-quarters, small-arms, and in their messes; he must frequently exercise them as prescribed by navy regulations; he is always on duty, and must be ever vigilant and watchful; setting at all times a good example of neatness and prompt respectful obedience, he must exact it from all others. He must keep a conduct-roll of all the crew, setting forth all their individual merits and carefully noting all their faults. He must keep a liberty-book, in which the names of all who obtain leave are entered, the length of time granted, the hour of their return, and their condition. He must keep a punishment-book, in which any and all punishments inflicted, for what cause and by what authority, are recorded. He must listen to all complaints, and, if necessary, present them to his captain. He acts as chief of police, and must be very watchful of his immediate subordinates in that department, to suppress the smuggling of liquor, theft, fighting, and gambling. He must be ready at all times to lead the crew, to head the battalion, or show the way to the weather-earing; ready always with his gold-laced and epauletted coat for fair weather, or his trumpet and oil-skin jacket for the midnight gale. He must be ready to promote and encourage all kinds of healthful and proper amusements among the crew, such as boat-racing, glee clubs, base ball, and particularly swimming; the comfort of the crew should be his constant study. But most difficult task of all, he must, by his influence and dignity, maintain good order, frowning down all license, stopping at once all improper discussion; if he wishes the cruise to be happy, he must first of all be true and loyal to his commanding officer, never permitting officers to criticise him in the presence of the servants, never himself doing so even to the officers. He must be equally careful not needlessly to open the captain's eyes to any of the little faults or minor breaches of discipline on the part of officers or men; he must learn when and what to hear or see, and as his relations with the captain are more or less confidential, he must be exceedingly prudent in his speech. He is held responsible for the cleanliness of the ship, her good order, neat and man-of-war-like appearance, and, above all, he is to do as he is told by his captain, to *promulgate* and *execute* his orders; and, last of all his duties, never to go ashore except on the sheet-anchor.—*W. T. Truxtun, Captain U.S.N.*

Exhaust. A term applied to the mechanism for releasing steam from a cylinder after having performed its work; and, also, to the ejected steam.

EXHAUST-PIPE. A pipe for conducting exhaust steam from a cylinder to a condenser, or to the atmosphere, or to any convenient place remote from the engine. When an exhaust-pipe terminates in a chimney, and has a contracted outlet for increasing the velocity of the escaping steam and inducing a draft, the contracted termination is called a *blast-pipe.*

EXHAUST-PORT. The opening or passage in a steam-cylinder through which the exhaust steam escapes.

Exhaust Steam. The steam that is ejected from a cylinder after having performed its work.

Exhaust-valve. A valve for releasing the exhaust steam from a cylinder, or for discharging any confined fluid from a vessel or chamber.

Exmouth, Viscount (Sir Edward Pellew), a celebrated English admiral, was born at Dover in 1757. He was descended from a Norman family, settled in Cornwall for many centuries. He entered the navy at 13 years of age, and was at once remarked for his daring, activity, and intelligence. Well suited to his profession, he rose to be a typical English sailor.

His first war-service was in our own country, at the battle of Lake Champlain, when he succeeded to the command of the schooner "Carleton," and, for gallant and skillful conduct, was given a lieutenant's commission. In the next year he served in Burgoyne's unfortunate campaign, in command of a detachment of seamen, whose tremendous labor, in the lakes and rivers, was entirely thrown away by Burgoyne's capture.

In 1782 he had command of the "Pelican," and destroyed three French privateers at one time, for which service he was made a captain. At the breaking out of the war with the French, in 1793, he was in command of the "Nymphe," 36, which ship is said to have been manned mostly by landsmen. In her, however, he captured the French frigate "La Cléopatre," a heavier ship. He was knighted for this action.

In 1794 he had command of the "Arethusa" frigate, and captured the French frigate "Pomone" in the course of a general action. In the same year he was given command of the second division of the Western Squadron, where he distinguished himself.

Always noted for deeds of personal daring, one of the most remarkable of these was his boarding the wrecked transport "Sutton," shipwrecked on the coast. The danger was imminent, but he took charge, and by his personal influence and great exertions saved the lives of all on board. He is, perhaps, better known to seafaring people for this action than from his subsequent achievements.

In 1798 he commanded the "Impétueux," in the Channel Fleet, and passed creditably through several actions.

He then entered Parliament, and was known as a strenuous supporter of Pitt.

In 1804 he was made rear-admiral of the blue, and commander-in-chief in India, when, by his rapid and well-considered measures, he succeeded in nearly clearing those seas of the French cruisers which had caused such havoc. He returned to England in 1809, and the next year was appointed commander-in-chief in the North Sea.

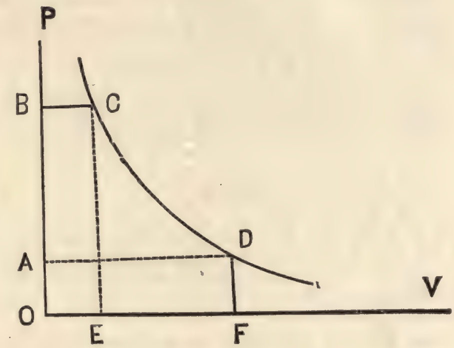
In 1811 he was commander-in-chief in the Mediterranean; and in 1814 was made Baron Exmouth, and K.C.B., and G.C.B. When, in 1816, the Dey of Algiers violated the treaty concerning prisoners, Lord Exmouth was sent out, with a powerful fleet, and made an attack upon that city, so famous in its curious history. The bombardment took place on the 26th of August, with considerable loss on the side of the English and their Dutch allies, and dreadful slaughter occurred among the Algerines. The result was the apology of the dey and the surrender of 1800 slaves. For this victory Lord Exmouth was made a viscount; and, shortly before his death, he became a vice-admiral.—*E. Shippen.*

Exocetus. A fish which comes upon the beach to sleep. A genus of fishes having very long and large pectoral fins, by means of which they are able to fly a considerable distance in the air,—the flying-fish.

Expansion. In naval architecture, the laying off the ship mathematically from a model or drawing to the full or building size. The enlargement of a body, whether solid, liquid, or gaseous, due to the separation of its atoms by heat. See Expansion of Steam, Cut-off.

Expansion of Steam. Accurate investigations of this subject are very intricate, and the formulæ deduced are complicated; but calculations sufficiently correct for many purposes may be made as follows:

Suppose a given weight of steam occupying the space represented by $O\,E = v_1$, at the pressure



$O\,B = p_1$, be admitted into a cylinder and to drive a piston; then to expand, its volume increasing to $O\,F = v_2$, and its pressure falling to $F\,D = p_2$, according to the law represented by the curve C D; and, lastly, to be expelled from the cylinder at the final pressure, then the

Energy transmitted, E =

$$\int_{p_2}^{p_1} v\,dp$$

the value of which, as given by Rankine's formula for a perfect gas, is

$$\int_{p_2}^{p_1} v\,dp = \frac{\gamma}{\gamma-1}.v_1 p_1 \left\{1 - \left(\frac{v_1}{v_2}\right)^{\gamma-1}\right\}. \quad (1)$$

when $\gamma = 1.408$ for air.

If the fluid is discharged from the cylinder at a lower pressure than that at which the expansion terminates, there is to be added to the preceding formula the term

$$v_2\,(p_2 - p_3)$$

making

$$E = \frac{\quad}{\gamma-1} v_1 p_1 \left\{1 - \left(\frac{v_1}{v_2}\right)^{\gamma-1}\right\} + v_2(p_2 - p_3) \quad (2)$$

This formula becomes still more complex for saturated steam.

Adiabatic Curve.—If the steam be allowed to expand without receiving or emitting heat, and the mechanical energy exerted during the expansion be entirely communicated to an exter-

nal body, such as a piston, the pressure p_2 will be less than it would had the temperature been maintained constant, because by expansion, heat is made to disappear. The curve C D governing the pressures of the several volumes is called an *adiabatic curve*, the simplest equation of which is, for a perfect gas,

$$p \propto \frac{1}{v^{\gamma}} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

If the steam while expanding be maintained at a constant absolute temperature, the curve C D is called an *isothermal line.*

The line O V may be regarded as a line of absolute cold, and an asymptote to all other isothermal and adiabatic curves.

It is frequently assumed in practice that the temperature remains constant, and that

$$p \propto \frac{1}{v} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

in which case the absolute pressure at any point of the curve C D may be represented by $\frac{p}{v}$, and the energy transmitted during an infinitely small expansion by $\frac{p}{v} d\,v$, which being integrated between the limits of $v = v_1$ and $v = v_2$, when v_1 represents the unit of measure of v_2, gives the energy transmitted during the whole expansion,

$$p_1 \int_{v_1}^{v_2} \frac{d\,v}{v} = p_1 \text{ hyp. log. } v_2 \quad . \quad . \quad . \quad (5)$$

and if the work $p_1\,v_1$, done before expansion, be added, the expression for the total energy becomes

$$\mathrm{E} = p_1 \int_{v_1}^{v_2} \frac{d\,v}{v} + p_1\,v_1 = p_1\,(\text{hyp. log. } v_2 + 1) \quad (6)$$

By subtracting the back-pressure $p_3\ v_2$, and denoting the total mean pressure by Pm, the effective energy

$$\mathrm{E}_1 = p_1\,(\text{hyp. log. } v_2 + 1) - p_3 v_2 = Pm.\,v_2 - p_3 v_2 \quad (7)$$

Mean pressure

$$Pm = p_1\,\frac{\text{hyp. log. } v_2 + 1}{v_2} \quad . \quad . \quad . \quad (8)$$

Initial pressure, when the mean pressure is given,

$$p_1 = \frac{Pm\,v_2}{\text{hyp. log. } v_2 + 1} \quad . \quad . \quad . \quad . \quad (9)$$

The relative weight of steam required to maintain a constant mean pressure for various grades of expansion may be represented by the cylinder full of steam at the final pressure, or,

$$p_2 = \frac{p_1}{v_2} = \frac{Pm}{\text{hyp. log. } v_2 + 1} \quad . \quad . \quad (10)$$

Suppose Pm to be unity and constant, then if

	Per Cent. of Gain. Successive.	Total.
$v_2 = v_1,\ p_1 = 1.00;\ p_2 = 1.000$		
$v_2 = 2v,\ p_1 = 1.18;\ p_2 = 0.590$	41	41
$v_2 = 4v,\ p_1 = 1.67;\ p_2 = 0.419$	17.1	58.1
$v_2 = 8v,\ p_1 = 2.65;\ p_2 = 0.325$	9.4	67.5
$v_2 = 16v,\ p_1 = 4.21;\ p_2 = 0.278$	4.7	72.2

This is a maximum result, and not nearly attainable in practice. By applying the exact thermo-dynamic laws of expansion, and deducting the losses by back-pressure, clearance, and friction of larger engine required, which increases with the several values of p_1, the per cent. of gain will be materially reduced.—*Albert Aston, Chief Engineer U.S.N.*

Expansion-gear. In the steam-engine, the mechanism for operating an expansion or cut-off valve.

Expansion-valve. See Cut-off.

Expedition. An undertaking by sea or land, with a peaceful design or with hostile intent. See Exploring Expeditions.

Expend. To use up or consume in service.

Exploit. An achievement; a feat; a successful deed.

Exploring Expeditions. Exploring expeditions, to examine coasts and seas unknown or imperfectly surveyed, have been undertaken from the earliest times. Maritime exploration, however, has never been so fruitful as within the past four hundred years. The earlier expeditions were of a commercial nature, and this was doubtless the motive that induced Jason to undertake the Argonautic expedition, the first in history,—1250–60 B.C. The great Egyptian monarch, Pharaoh Necho, is said to have obtained the circumnavigation of Africa, 630 B.C.,—Phœnicians, under his orders, performing it by landing and sowing grain during the summer, thus occupying three years in the voyage. During the three centuries preceding the birth of Christ, the Carthaginians led the van in maritime discovery. Impelled by a mercantile spirit, they discovered the Scilly Islands, explored the coast of Spain, Africa as far as Cape Nun, which Hanno is said to have reached. Nearchus, the admiral of Alexander's fleet, made many important explorations of the coasts and islands of the Persian Gulf during his five months' voyage. The geographical knowledge disseminated by the writings of Erastosthenes, Strabo, Hipparchus, and Ptolemy prepared the way for the modern science of geography, and led to the development of maritime discovery and exploration after the nations had arisen from the wreck of the barbarian incursions, and when better navigation and sounder ships enabled such voyages to be undertaken. Aside from the general decay of knowledge, the unsettled state of society, and the prevalence of piracy at sea, the dominant nation for centuries—the Romans—were not a maritime people, and sought their triumphs by land. The navigation of those times was confined to coasting from head to headland; the stars and landmarks were the only guides, and daytime and the favorable seasons only were employed in navigation. But about the middle of the 14th century the mariner's compass was introduced; ships able to breast the stronger waves of the Atlantic, and able to sail with a *side wind*, were built; maps and charts of better construction appeared; the astrolabe, the first astronomical instrument of navigation, was invented, and a maritime school was established by Prince Henry of Portugal. The expeditions sent from there greatly encouraged adventurous mariners to penetrate farther into the unknown west, and these voyages soon bore fruit.

The first exploring vessel was sent out in 1410, and reached Cape Nun, and this initiatory voyage was followed by others, sent by Henry

and the kings of Portugal. In 1416 a vessel reached Cape Bojador, and in 1418, Juan Gonçalves Zarco, in a *barcha*, with Tristan Vaz Teixera, sailed on a voyage of discovery, and, being blown off the coast, discovered Porto Santo, one of the Madeiras. In 1420, they again sailed, with three vessels, discovered Madeira (visited before by an Englishman), and burned its woods, planting the vine and sugar-cane. Gil Eanez, in 1420, tried to pass Cape Bojador, but failed, succeeding, however, in a second voyage in 1433. In two succeeding voyages he finally reached Rio do Ouro, or Gold River. In 1432, Cabral was sent out by Prince Henry, and discovered the Azores. Expeditions were undertaken in 1440 (defeated by stress of weather), in 1441, and in 1442, more for plunder than for discovery, but gold was then first found. In 1443, Nuñez Tristan, who had commanded the last two expeditions, again sailed, advancing as far as Alguin Bay, and to the Gambia River in a succeeding voyage. No important discoveries were made in the three succeeding voyages. In 1447, Lançarot, with several caravels, explored as far as the Senegal River. In 1455, Cada Mosto, a Venetian, sailed in a Portuguese caravel, and again in 1456, with two caravels, exploring and describing the coast, then discovered the Cape Verde Islands; and the same year De Cintra and De Costa, with two vessels, went as far as Cape Mesurado. This was the last expedition under Prince Henry, the founder of modern discovery and exploration. In 1471, Santarem and Escobar discovered the Gold Coast and Cape St. Catherine. The trade with Africa was farmed by the Portuguese government, and discovery relaxed somewhat. Under John the Perfect it again revived, and the attention of other nations to the subject was soon manifested by their attempts. In 1484, Diego Cam reached the Congo River, and in 1487, Bartholomew Diaz sailed with 3 caravels, discovered the cape at the southern point of Africa, and named it Cabo Tormentoso. In 1484–86, Martin Beheim is said to have reached Brazil, but accounts of this are vague. These voyages paved the way for the great explorer, Christopher Columbus. Ferdinand of Spain was induced to grant him 3 vessels and 90 men, and he sailed from Palos, Spain, August 3, 1492. He touched at the Canaries, and then boldly struck towards the west. Previous explorers had kept nearer the land, until accidental discoveries of the islands led them there in subsequent voyages; but Columbus, firmly believing in the rotundity of the earth, boldly sought the Indies by sailing around it. His timorous sailors feared the unknown sea, and nearly frustrated his plans; but finally he was rewarded by a sight of the land, and on Friday, October 12, he discovered Guanahani, which he called San Salvador. He discovered Long Island, Exuma Island, and Watling's Island in the course of his explorations this voyage, and Cuba on the 28th October, and St. Domingo on December 6. He lost his flag-ship, but got safely back, touching at the Azores and the mouth of the Tagus, and arriving at Burgos, Spain, March 15, 1493. The news of his discovery of the Indies spread abroad, and soon other explorers were seeking western lands. A papal bull granted these waters to the Spanish, reserving to the Portuguese explorations east of a line at first 100 leagues, afterwards 370 leagues, west of the Azores. Columbus sailed, as viceroy of the new country, with 17 ships and 150 men, to colonize the new lands, September 25, 1493. On the 3d November he discovered Dominica (Sunday) Island, and Marie-Galante, Guadeloupe, Montserrat, Antigua, St. Matthew, St. Bartholomew, Santa Cruz, Porto Rico, and others in succession, arriving at the latter island April 24, 1494. He sailed with 3 vessels April 24, 1494, discovered many islands near Cuba, explored its coasts, discovered Jamaica May 14, and the islands in the Mona passage. He sailed on his third voyage with 6 ships May 19, 1497, and then discovered the coast of Venezuela, Trinidad, and other islands, and, on arriving at Hispaniola, was sent home in chains.

In his fourth voyage, with 2 ships and 170 men, in 1502, he explored the coast of Honduras, and this was his last exploit.

England was the first to profit by the discovery, and John and Sebastian Cabot sailed in June, 1496, with 2 ships and 300 men. They discovered the island of Newfoundland, and explored the continent as far as Chesapeake Bay. Sebastian Cabot afterwards sailed on other expeditions,—the first in the Spanish service, to South America, and subsequent ones in search of northwest and northeast passages. These latter voyages belong to Polar exploration.

The Portuguese king sent out in 1496 Vasco da Gama with 4 ships and 120 men. He sailed July 9, 1496, explored the coast of Africa, passed the Stormy Cape, now Good Hope, discovered Mozambique, and first found the passage to India, laying the track for future voyages. Jealous of the Spanish discoveries in the west, Ojeda and Vespucci were sent in 1499, by the Portuguese king, with 4 ships. They discovered the continent of South America, about the Orinoco, and in a second voyage discovered Brazil. Amerigo Vespucci, the pilot of these expeditions, sailed again in 1501 with 3 ships, explored the Brazilian coast, and crossed to Africa. In 1503, with 6 ships, he discovered St. Matthew Island and Bahia, and first published accounts of the new world, which became known as *America*.

With the new century the spirit of discovery and exploration started afresh. The Portuguese, first to open the way, led the van in the 16th century also. Pedro Alvarez Cabral sailed in 1500 with 12 ships and 1500 men, partly to colonize the new Indian possessions. He sailed March 8, explored the coast of Brazil, crossed to Africa, doubled the Cape of Good Hope, and touched at Sofala, exploring much of the coast. At the same time Gaspar de Cortereal sailed with 2 vessels to the westward, explored Newfoundland, discovered the St. Lawrence and Labrador, and named them. Returning on a second voyage, in 1502, he was lost. From 1500 to 1510 many expeditions were sent from Portugal to India, but they were for colonization and trade, although in many of them important discoveries were made. Albuquerque discovered Zanzibar in 1503. Juan de Nova Castella first saw St. Helena in 1502. Tristan d'Acunha discovered the island called after him in 1506, and Madagascar in 1507. Diego Lopez de Sequerem explored the coasts of Malacca and Sumatra, and many other discoveries were made by traders and India fleets. Spain was not idle. In 1508, Vincente Jañez Purzon and Juan de Solis sailed along

the coast of South America from the equator to 40° S. In 1512, De Solis explored the whole coast of Brazil, and discovered the La Plata and the Parana, and colonies were soon planted there. The same year Juan Ponce de Leon sailed from the Spanish colonies and discovered Florida. In 1517, Cordova explored the coast of Campeachy, in 1518, Juan de Grijalva the coast of Honduras, and the same year Francis de Garay sailed down the coast of Florida. The following year saw the advent of Fernando Cortez and the establishment of a Spanish kingdom on the continent, and many voyages of discovery ensued thereafter.

But the greatest maritime event that had happened since the voyage of Da Gama was that of Magalhaens. He sailed from Seville in 1519, on the 20th of September. After exploring the coast of Brazil, and wintering in Patagonia, he sailed through the straits that bear his name. Of his 5 ships, one was here lost and one returned to Spain, but he pushed into the hitherto unexplored South Sea, discovered the Ladrones, Philippines, Jardines, and other islands in that sea, and was killed at Zebu. One vessel reached San Lucar, Sept. 6, 1522, with 18 men, and thus the first circumnavigation of the globe was accomplished in 1154 days. Cortez and subsequent viceroys of New Spain sent out many expeditions of discovery and exploration from 1520 to 1524. In 1525, Francis Pizarro and Diego de Almagro sailed south and discovered Peru, afterwards conquering it and establishing an empire there. A fleet of 7 vessels sailed from Corunna in the same year, one of them sailing around the continent of South America, the others going to the Moluccas.

Francis I. sent John Verrazzani, 1523, to explore the new continent, and again in 1524. He is said to have discovered Florida, before seen by Ponce de Leon.

Sebastian Cabot sailed again for the king of Spain in 1526, explored the La Plata, ascended north 120 miles in his ships, and 480 miles farther in boats; also exploring the Parana and Paraguay Rivers. Cortez sent Alvarda de Saavedra, in 1527, into the South Seas, and New Guinea was then first seen, and many smaller islands. Francis I. sent Jacques Cartier from St. Malo with 2 ships of 60 tons in 1534. He explored Labrador, discovered the Magdalen Islands, Chaleur and Gaspé Bays, and took possession of the new country in the name of the king of France. In a second voyage, in 1535, he sailed through Belleisle Straits, and explored the St. Lawrence and Saguenay, wintering there. In a third voyage, in 1541, he made other explorations of Canada under the command of Roberval. In 1536, Cortez sent Juan de Grijalva to explore the west coast of America, and the same year himself sailed, discovering the Gulf and peninsula of California. The same year Grijalva sailed into the South Seas, and discovered many islands about the Moluccas, Spice, and Philippine groups. In 1539, Francis de Ulloa explored both shores of the Gulf of California, and the west coast of the peninsula as far as 32° north latitude. In 1540, Orellana explored the Amazon, and in 1541 Don Stephen de Gama explored the Red Sea, Abyssinian coast, and Arabian shores. In 1542, another Spanish fleet, exploring the west coast of America, sailed north to 40°, and saw the Sierra Nevadas. The same year a fleet of 6 vessels sailed into the South Sea, and discovered the Pelew and other islands. The next year De la Torre explored the Philippines. The Spaniards, anxious to reach their new possessions, sent expeditions to find the northwest passage, and, in 1542, Cabrillo explored the coast of California as far as 44° north, naming Cape Mendocino. The voyages of Frobisher, Smith, and Davis belong to Polar exploration. In 1553, Sir Hugh Willoughby and Richard Chancellor passed Norway, and sailed into the White Sea. In 1562, Jean de Ribaut sailed with 2 vessels from France, and explored the coast of Florida and South Carolina. The voyage of Drake in 1577, important from discoveries made, was a predatory incursion against Spanish commerce. In 1582, Gualle, under Spanish colors, first explored the seas north of Japan, discovered New Georgia and many other points on the northwest coast of America. Cavendish sailed July 2, 1586, with 3 vessels on a voyage of discovery. He explored the coast of California, traversed the South Seas, and sailed around the globe, discovering many islands in his voyages. He essayed a second voyage, but died at its commencement, and nothing was accomplished. Hawkins discovered the Falkland Islands in 1586, and the Dutch sent several expeditions in search of the northwest passage. But the wars between Spain and England paralyzed discovery during the latter part of the century. Much remained yet to be explored.

The next century opened with brighter promise to the explorer. The invention of the telescope (1609), of the octant in 1732, of chronometers in 1736, and the improvement in maps and charts by Mercator (1550) and Wright (1559), the progress in astronomy by the studies of Galileo, Copernicus, and Tycho Brahe, habitude in making longer voyages at sea, and better ships, gave the mariner better instruments and more exact means of making these voyages successful.

The first to open the way of discovery was Hendrik Hudson. His first voyage, in 1607, was in search of the northwest passage, and he explored Greenland. His second voyage was to the northeastward, but the ice stopped him. It is his third voyage that concerns us, when he discovered the river that bears his name, sailing up it to the head of navigation. His fourth voyage belongs to Polar exploration. In a voyage of a warlike nature in 1606–7, Van Voort discovered New Holland. In 1607, Quiros sailed to the South Sea in search of a continent, and discovered Otaheite. Le Maire and Schouten sailed from Holland in 1675 with 2 ships in search of the same continent and a passage to India. They discovered Le Maire Straits and Staten Land, first doubled and named Cape Horn, and discovered many islands in the Pacific, and also New Zealand and New Guinea. Baffin's voyage in 1619 was Arctic, and exploration flagged for a while.

In 1642, Abel Jansen Tasman sailed with 3 ships from Batavia. He discovered Tasmania on the 24th of November, 1642, naming it Van Diemen's Land. Van Vlaming explored carefully the coast of New Holland towards the close of the century. An expedition under De Vries explored the waters north of Japan. Dampier's voyages, adding much to our knowledge of the East Indies, at the close of this and the

beginning of the next century, were buccaneering expeditions, and many discoveries were made during the privateering voyages of Capt. Woods Rogers in 1708–11.

But the first exploring voyage of the 18th century was that of Vitus Behring, a Russian, in Arctic regions. He first ascertained Kamskatka to be a peninsula. A Russian trading company made many discoveries in their mercantile voyages. Capt. John Clipperton explored the coast of China in 1719, and Capt. Shelvocke explored farther the northwest coast of America, and sailed round the world.

The Dutch East India Company sent an expedition of 3 ships under Commodore Roggewein in 1721, to explore the southern continent. Visiting Brazil, they rounded Cape Horn, discovered Easter Island, Aurora Island, Roggewein and other islands, coasted New Guinea and the Moluccas. His ships were seized at Batavia, and he went home in the company's ships, sailing around the world.

The voyage of Lord Anson, 1740–43, was against Spanish commerce, although many discoveries were made. Admiral Byron sailed on a voyage of discovery from England in 1764, explored the Straits of Magellan, discovered Disappointment, Danger, and many other islands in the South Sea, explored the Solomon and Ladrone Islands, and sailed around the world. Capt. Wallis, in his voyages, 1766–68, sailed around the world, discovered Whitsun Island, Queen Charlotte Island, Egmont Island, Wallis Island, and others, giving their positions carefully. Capt. Philip Carteret, sailing with him from England, parted company at the Straits of Magellan, sailing to the southward, and discovered Osnaburgh, Keppel, Volcano, Duke of Gloucester, and other islands, explored New Britain, New Ireland, Philippine, Celebes, and other groups, and sailed around the world. But the most famed navigator of the century was Capt. James Cook. He first sailed in 1768, with astronomers, to observe the transit of Venus. Patagonia, Tierra del Fuego, Le Maire Straits, and other localities were more carefully explored and described, and Cook sailed to the southward as far as 60°, then sailed north, discovered many islands in the Society group, and landed at Otaheite. That and the neighboring islands were thoroughly and carefully explored. He then coasted along the islands of New Zealand and New Guinea, and the continent of Australia. He then returned by way of Batavia and Cape of Good Hope. The same year that Cook sailed, Louis de Bougainville was sent out from France. After surrendering the Falkland Islands to England, he sailed with 2 vessels into the South Sea, discovered Dangerous Archipelago, visited Tahiti, named Pentecost Island, and, touching at Batavia, completed the circuit of the globe. Cook's second voyage, in the "Resolution" and "Adventure," began July 13, 1772. He went to the southward of America, the first to penetrate into the icy sea, advancing as far as lat. 71°. He believed that he had disproved the existence of a continent there. He then explored New Hebrides and New Caledonia, Society and Friendly Islands, and discovered the Sandwich Islands. His third voyage was undertaken in 1778, when he explored the Sandwich Islands and the northwest coast of America, advancing as far as lat. 70° 40′ north. He was killed February 14, 1779, at the Sandwich Islands, and little was accomplished during the rest of the voyage. The voyage of Capt. Phipps, in 1773, in which Nelson was engaged, belongs to Arctic exploration. The Spaniards explored the west coast of North America, advancing in 1775 as far as 58° north. The unfortunate La Perouse sailed with 2 vessels from Brest, August 1, 1785, on a voyage of discovery. Carefully exploring and mapping the west coast of North America, from lat. 60° to Monterey, he sailed south, and after many discoveries in the South Seas, his vessels were lost. An expedition sent in search of them, under D'Entrecasteaux, explored Van Diemen's Land, New Caledonia, New Hebrides, New Zealand, and other islands, in 1791. In 1791, George Vancouver sailed with 2 ships from England. He surveyed the Sandwich Islands and the coast of Northwest America, naming the island that still is called after him. The French sent Kerguelen to find the southern continent, which he imagined he had done on his first voyage, but a second proved it to be a barren island, now called by his name.

The present century has been fruitful in exploration, but by far the greater part of this has been directed to the Arctic regions, and will not detain us. Many important expeditions of general discovery and exploration have nevertheless been undertaken. England was the first to inaugurate the century, and Capt. Flinders, in July, 1801, sailed to explore Australia. He made careful surveys of much of the Australian coast, of Northumberland and Cumberland Islands, and added greatly to the knowledge of these distant lands. He was detained by the French government, and did not reach England until 1810. The expedition of Krusenstern, in 1803–6, was intended to establish relations with Japan; and although this object failed, he surveyed much of the coasts of North America and Asia.

In 1815 the Russians followed this up by sending Kotzebue on an exploring tour. He spent three years exploring the north coast of America and Asia, and made many discoveries in the South Sea, in this and another voyage in 1823. In 1817, De Freycinet, a French navigator, explored the South Seas, adding much to our knowledge of them. In 1819, Capt. Bellingham, a Russian, went as far south as 70° latitude; and in 1821 he discovered Alexis and Peter's Island, near the Antarctic continent. Capt. Weddel, in sealing voyages, went as far as 74° south in 1823, and made discoveries in Antarctic regions. Capt. Biscoe, in 1832, in sealing voyages, discovered Graham Land, a part of the southern continent. In 1836, Sir Edward Belcher sailed on a voyage around the world in the "Sulphur," and made valuable explorations of the islands and countries in the South Sea, adding greatly to the hydrographic knowledge of those localities. In 1838, the first American exploring expedition of magnitude sailed. Lieut. Charles Wilkes, in command of 5 vessels, left Norfolk, August 18, 1838, and spent four years in an exploration of the globe. After touching at Madeira, Cape Verde, and Rio, the fleet separated, reuniting after an exploration of the waters about Cape Horn. The

Paumotoo, Tahiti, and Samoan Islands were then explored, many new islands being discovered, and Wallis and Sydney visited. Capt. Wilkes then sailed southward, and three of his vessels found the Antarctic continent, Wilkes following north up to 70° longitude. The existence of a continent, disbelieved by Cook, was thus proven. Wilkes then visited New Zealand, Feejee Islands, Sandwich Islands, and explored the Columbia and Sacramento Rivers. He sailed from America again, November 1, 1841, visited Manilla, Sooloo Archipelago, Borneo, and Singapore, and arrived at New York, June 10, 1842, having lost 2 of his vessels. Wilkes sailed along 3000 miles of the Antarctic continent; and the same year (1840) D'Urville, sent out by the French government, sailing from Hobart Town, discovered the same land, coasting from 136° to 142° east longitude. D'Urville made many other explorations in the South Seas during his two years' voyage. Sir James Ross sailed from England in 1839 with 2 vessels, and discovered the same continent in 1841, naming two mountains that he saw "Erebus" and "Terror," and ascended to 78° 10′ north, the farthest that has yet been attained in those regions. He afterwards, in 1842, visited Graham Land and Shetland, reaching 72° latitude on that side of the pole.

In 1852, Commander Lynch explored the coast of Africa, ascending many of the rivers, from the Gambia to Liberia. The same year, a second exploring expedition of 5 vessels sailed from the United States, commanded by Capt. Ringgold. After reaching Cape of Good Hope, the squadron divided into two, and explored Van Diemen's Land, Caroline Islands, Ladrone Islands, and Bonin Islands, the Sunda Straits, Sooloo Sea, and the fleet assembled at Hong-Kong. There Lieut. John Rodgers succeeded to the command, and explored and surveyed the Bonin, Ladrone, and Loochoo Islands. One vessel was lost, but surveys were subsequently prosecuted among the islands to the south of Japan, in the Kurile, among the Aleutian Islands, and in Behring's Straits. Lieut. Rodgers advanced as far as 72° north in the Arctic regions, and the expedition returned in 1855. In 1856, Commander Page surveyed the La Plata and Parana Rivers in a steam-vessel, the "Water-Witch," until a rupture with the Paraguayan authorities compelled him to quit. Besides these, other expeditions of a local nature have taken place to survey the Isthmus of Panama, the Amazon River, or for the exploration of the continents of Australia and Africa, but these properly belong to inland travels.—*F. S. Bassett*, *Lieutenant U.S.N.* See Polar Exploration.

Explosion. See Explosives.

Explosives. *Explosion.* The sudden and violent expansion of a body by its component parts acquiring a great increase of bulk.—*Encyc.*

A bursting with noise; a bursting with a sudden expansion of any elastic fluid with force and a loud report.—*Dict.*

These definitions include many actions of a physical character, such as the bursting of steam-boilers, and the term is also applied to the sound, to the effect, etc. More strictly, explosion means the result of chemical action occurring in certain substances called explosive agents or explosives. In this sense the word is synonymous with explosive reaction, and may be defined as a chemical action which causes the sudden, or extremely rapid, formation of a very great volume of highly expanded gas. An explosive reaction does not differ in kind from other chemical reactions, but only in degree. The explosive character of a reaction depends upon its possessing the two essential features, great change of state, and quickness of action. The volume of the gas produced is very much greater than that of the substance from which it is derived, and it is still more expanded by the heat evolved during the action. The greater the volume of the expanded gas the more powerful the explosion, and *vice versa.* The time required for the occurrence of the change must be very short, and the shorter it is, the more highly explosive the reaction becomes.

Conditions of Explosion.—The amount and kinds of gas given off in an explosive reaction, depend upon the chemical composition of the explosive substance and the character of the change it undergoes. The conditions or circumstances of explosion may affect these results considerably. Thus, gunpowder fired in a mortar gives different products than when fired unconfined, and nitro-glycerine exploded under certain circumstances gives noxious gases which are not found under other conditions. Practically, however, the effect of condition on the character of the change is mostly seen in the comparative rapidity of the action.

The physical or mechanical condition of the explosive substance is of much importance. Thus, dynamite avoids the inconveniences of the liquid form of nitro-glycerine, while it preserves unimpaired the readiness of explosion by the appropriate means. Gunpowder, in large grains and highly compressed, burns more slowly than if in small grains, or of low density. Gun-cotton in its various mechanical states passes through all gradations from rapid burning to sudden and violent explosion.

Confinement is the principal external condition affecting an explosion. Confinement is necessary to obtain the full effect of an explosive, but the more rapid the action the less the confinement needed. Yet even the quickest of explosives, like a fulminate or chloride of nitrogen, requires a certain confinement to develop its power. With the rapidly acting agents, however, the amount of confinement required is small, and is usually obtained necessarily in use. The slower substances, like gunpowder, require strong confinement, in order to allow time for the spread of the action through the mass of the charge. Or, means may be taken to quicken their action, as by special modes of firing, and so the confinement needed diminished.

The explosive reaction is very much influenced by the manner of bringing it about. The effect obtained when a substance is exploded by a sharp shock or blow, derived from the explosion of a fulminate, is very different from that produced when firing is caused by a flame. This difference is due to the greater rapidity of transmission of the exploding impulse through the mass of the material acted on. The transmission of the ignition by flame proceeds more slowly from particle to particle. Consequently, when a fulminate is the exploding agent, the time of action is shortened, so that the explosion becomes

sharper and more violent. The term *detonation* is applied to the sudden and violent explosion produced in this way. The action of the detonator may be well compared to a sudden application of a powerful mechanical force, like a blow from a heavy hammer. The particles of gas from the initial explosion strike percussively upon the particles of the mass to be fired, and meeting with resistance, their energy is converted into heat. But the effectiveness of this action will evidently very largely depend upon the suddenness of the percussive blow. In general, then, it may be said that the readiness with which the explosion of one body will produce that of another will be governed by the amount of force it gives *in the shortest time.*

While this is true in the main, it does not account for certain peculiarities attending explosions. An explosive body is one which is readily affected by disturbing actions. Its parts are held together in a nicely balanced equilibrium, which is easily overbalanced, and the destruction of the system results. The extremely sudden application of great mechanical force tends directly to the disorganization of the body. But there are certain forms of force, or modes of applying force, to which the substance is more sensitive than it is to others. It is found that fulminating mercury is much more effective and ready in producing the explosion of other bodies than many agents which are more powerful or even more sudden. This is as if the shock or blow of the fulminate had some peculiar quality to which other substances were sensitive. The fulminate gives an impulse or vibration to which the others respond, and which, therefore, exerts a greater disturbing action upon them than is caused by a mechanical excitement which does not possess this special vibration. This theory, which is due to Abel, has been strongly supported by his experiments, and by those of Champion and Pellet. The latter have shown that the vibrations produced by different explosions are unlike, and that certain vibratory motions produced explosion more readily than others.

The distinction between detonation and simple explosion is one of degree, and not of kind. The essential peculiarity of the detonation is found in the shortness of the time required for it. Perfect detonation, then, is the instantaneous explosion of the whole mass of a body. There is a great difference in explosive substances in regard to their susceptibility to detonation. Some, like nitro-glycerine, gun-cotton, and the fulminates, are readily detonated, and are known as the detonating explosives. Probably all explosives can be detonated, if the proper method is taken. Evidently, however, detonation will be much less readily brought about with a mechanical mixture like gunpowder than with a definite compound like nitro-glycerine. Still, as has been shown by Abel and by Roux and Sarrau, gunpowder can be exploded with much more violence when the mode of firing is an initial explosion of fulminate (Abel) or of nitro-glycerine (Roux and Sarrau) than when it is a simple inflammation.

Relative Force of Explosive Agents.—Knowing the composition of the explosive, the resultants of the reaction and the heat evolved can be determined, and from these data a comparison of force may be drawn. Berthelot calculates the quantity of heat generated and the volume of gas formed. The product of these numbers gives him a "term of comparison between the pressures," which, though not an exact measure of the true pressure, is obtained from two characteristic and experimental elements.

The following table shows some of his results:

Explosive Substance.	Quantity of Heat evolved per kilo.	Volume of Gas formed.	Product of two preceding Numbers.	Ratio.
	cal.	*m. c.*		
Sporting-powder	641,000	0.216	139,000	1.01
War-powder	608,000	0.225	137,000	1
Blasting-powder	510,000	0.173	88,000	0.64
Nitrate of soda powder	764,000	0.248	190,000	1.38
Chloride of nitrogen	316,000	0.370	117,000	0.85
Nitro-glycerine	1,320,000	0.710	939,000	6.85
Gun-cotton	590,000	0.801	472,000	3.44
Nitrated gun-cotton	989,000	0.484	480,000	3.5
Chlorated gun-cotton	1,420,000	0.484	680,000	4.96

This comparison, he claims, "accords in general with experience."

Sarrau considers that the force of an explosive substance is nearly proportional to the product of its heat of combustion by the weight of the permanent gas produced by the combustion. From experimental determinations of the weights of permanent gas given off on explosion, he calculates the force of some explosive substances, and thence derives the following table, showing the relative force they exert. In this table the force exhibited by powder is taken as unity, and is the mean of determinations made with five varieties.

Name of Substance.	Relative Force.
Saltpetre powder	1
Chloride of nitrogen	1.08
Nitro-glycerine	4.55
Gun-cotton	3.06
Picrate of potash	1.98
Mixture of 55 pts. picrate of potash and 45 pts. saltpetre	1.49
Mixture of equal weights of picrate and chlorate of potash	1.82

If the character of the chemical change occurring in an explosion were perfectly known the total force exerted might be calculated, but a comparison based upon such calculations would not certainly give the relative useful effect. For the circumstances of use seriously affect the relative *practical* value. Under certain conditions, the detonating explosives are much more effective than the slower ones, while in other cases the reverse may be true. Therefore, whatever may be the relative force *possessed* by the different explosive substances, their *comparative value* must be obtained from the results of practice, and then it will be found that the comparison will vary with the conditions of use.

Roux and Sarrau give a comparison of relative force derived from direct experiment. The relative effects were approximately measured by determining the quantity of each substance required to rupture cast-iron shells of nearly equal strength. They also used two modes of firing, so that they had explosions of the first order, or detonations produced by fulminate (except with gunpowder when nitro-glycerine was taken), and explosions of the second order, or simple explosions, produced by the application of flame.

Some of their results are given in the table below:

Name of Substance.	Explosive Force. 1st order.	2d order.
Mercury fulminate	928	.....
Gunpowder	434	100
Nitro-glycerine	1013	480
Gun-cotton	646	300
Potassium picrate	531	182

Considering the ordinary circumstances of practice, the following comparison may be said to indicate about the average relative force of the usual explosive agents:

Name of Substance.	Relative Force.
Gunpowder	1
Nitro-glycerine	8 to 10
Dynamite, 75% nitro-glycerine	6
Gun-cotton	4 to 6
Picric powder, from ammonium picrate	2 to 2.5

General Composition of Explosives.—Many substances are known possessing explosive properties to a greater or less extent, but of these few are of practical value as explosive agents. It is convenient to divide explosives into explosive compounds and explosive mixtures. In a compound, the elements composing it are in chemical combination, while a mixture is prepared by mixing mechanically the ingredients which make it up.

Explosive compounds, with some unimportant exceptions, are essentially composed of carbon, hydrogen, oxygen, and nitrogen. On explosion, the carbon and hydrogen unite with the oxygen to form carbonic acid gas and water (gaseous at the temperature of the reaction), and the nitrogen is set free. The action, then, is like an ordinary combustion, except that it is extremely intense and rapid from the previous intimate association and intermixture of the combustible with the oxygen. The nitrogen plays a very important part in such a compound. It brings into the body a large proportion of oxygen, which it readily yields to the carbon when decomposition occurs. As its attractive power for other elements is feeble, its presence in the compound confers the ready decomposibility necessary to an explosion.

Explosive mixtures, properly so called, are those in which the explosive property is dependent upon the fact of mixture,—that is, the ingredients of the mixture do not have explosive properties separately from it. Gunpowder is such an explosive mixture, as sulphur, charcoal, and saltpetre are not explosive substances, but the explosive property is attained when mixing has been accomplished. In principle, explosive mixtures of this sort are very simple in composition and all essentially alike. In general, two kinds of ingredients go to make such an explosive agent, one being combustible and the other capable of furnishing oxygen. The principal combustible body is almost invariably carbon or some carbonaceous substance which also contains hydrogen. Sometimes sulphur, or other oxidizable material, may be a constituent. The body supplying the oxygen is, in nearly all cases, a nitrate or a chlorate, either of which is a powerful oxidizing agent. In a nitrate, the oxygen is retained with considerable force, so that a strong external influence is required to separate it. In general then, the mixtures made from the nitrates are not very easily exploded, and their action is comparatively moderate. They are not sensitive to mechanical actions like friction or percussion. The chlorates yield their oxygen much more readily, and mixtures containing them are very sensitive to friction and percussion and explode with great sharpness. Of the nitrates, the potassium and sodium salts are the only ones used to any extent in practice. They enter into the numerous compositions included under gunpowder. Of the chlorates, the potassium salt is the only one used in the preparation of explosive mixtures.

Evidently, the number of possible explosive mixtures is great, since there are many substances of a combustible nature. The action taking place on explosion is the same in all. The carbon is oxidized to carbonic acid gas and the hydrogen to water (steam) with the evolution of great heat and, if a nitrate is present, its nitrogen is set free. Other substances remain behind in the solid residue, or also enter into the formation of gas. This action is very similar to that of an ordinary combustion of carbonaceous fuel, intensified and hastened by the previous mixture of the materials.

There is another and numerous class of mixtures having explosive properties which contain explosive compounds. The object of the mechanical mixing performed in preparing these agents is not to gain thereby the explosive property, but to obtain some advantage in use or handling. Thus, nitro-glycerine is found in a great number of mechanical mixtures, but in them all it is still the same body, and it is the explosive power of the nitro-glycerine which gives value to the mixture. It is therefore better, as well as more convenient, to treat such mixtures in connection with the explosive compounds to which they belong.

The principal explosive compounds which demand particular consideration are Nitro-glycerine, Gun-cotton, the Fulminates, and the Picrates.

Of the explosive mixtures, gunpowder in its somewhat varied forms is the most important. But as gunpowder is the subject of a separate article (q. v.) it will not be specially treated in this one. It will only be necessary to briefly allude to some others of the mixtures.

NITRO-GLYCERINE.—*Syn.* Nitrin; Glyceryl Nitrate; Glonoin, or Blasting Oil.

History and Modes of Manufacture.—Discovered by Sobrero in Pelouze's laboratory, in Paris, in 1847; first applied as an explosive agent by Alfred Nobel, in 1863. When first brought into use numerous severe accidents created a strong prejudice against nitro-glycerine, which has been gradually removed as its properties and mode of preparation have become better understood. Its practicable use as a blasting agent was brought about by Nobel's discovery that fulminating mercury exploded it perfectly. In 1866 dynamite was brought out, by which the power of nitro-glycerine is retained in a more convenient form, while its dangers are largely avoided. So that now, nitro-glycerine and its preparations are very extensively used all over the world.

Nitro-glycerine is formed by the action of concentrated nitric acid upon glycerine at a low temperature. The method of making it consists, essentially, of the careful mixing of the glycerine with the acid, the separation of the nitro-gly-

cerine, and its thorough washing. The strongest nitric acid attainable must be used (sp. gr. 1.5, not less than 1.45). The glycerine must be pure and nearly anhydrous. In order to take up the water, which is a by-product of the reaction, the nitric acid is mixed with twice its weight of sulphuric acid (oil of vitriol). The sulphuric acid takes no direct part in the formation of the nitro-glycerine, but serves to prevent the dilution of the nitric acid.

Nobel's Method.—In a leaden tank is placed a large quantity of the mixed acid. This tank stands in a wooden outer tub, with space between for the circulation of cold water. In the tank revolves a shaft carrying paddles, and also a cylinder on hollow bearings, so that a current of cold water can be sent through. This cylinder and paddles serve to agitate the liquid, insuring the rapid mixture of the glycerine with the acid, and aid in cooling. The glycerine runs in a fine stream from a vessel above, upon the upper surface of the cylinder. Sometimes, instead of the revolving cylinder, a coil of pipe for the transmission of cold water is placed in the tank and a vertical agitator in the centre. At some factories the tank is of iron, and has a coil of iron pipe. Over the top of the apparatus should be placed a hood or draft arrangement for carrying off fumes. After the mixing of the glycerine with the acid has been accomplished, the liquid is run off into a large volume of water, which dilutes the sulphuric acid, while the nitro-glycerine separates and falls to the bottom of the tub, as it is a heavy liquid, not miscible with water. It is then drawn off for washing by repeated agitations with water and alkaline solution.

Mowbray's Method.—The mixed acid is placed in earthenware pitchers, which stand in troughs surrounded by ice and water. Behind the troughs passes a pipe, bringing compressed and cooled air, which is forced down into the acid mixture through glass tubes, connected by rubber tubing, to jets on the air main. On a shelf over the troughs stand bottles, each containing the amount of glycerine required for the acid in one pitcher, and each having a rubber siphon-tube with a glass tip, through which the glycerine is drawn over, dropping into the pitcher below. The filled pitchers stand in ice-water for some hours before the operation begins, and while it is going on, the current of compressed air forced into the acid liquid keeps it in constant agitation. After the glycerine has run over, the pitchers are emptied into a large volume of water for the precipitation of the nitro-glycerine, which is then washed by agitation with water (and alkaline solution) and a stream of compressed air.

Boutmy and Faucher's Method.—The glycerine is mixed with sulphuric acid (forming glycero-sulphuric or sulpho-glyceric acid), and this mixture is added to the mixed acid, the whole being allowed to stand 24 hours. The quantities used are mixed together at once, and time is allowed for the completion of the action.

Kurtz's Method.—The acid is contained in a narrow vertical cylinder of lead or iron with conical bottom. Two pipes reach to the bottom of the cylinder, one bringing glycerine and the other compressed air. These pipes have small orifices, and are so placed that the stream of air strikes the glycerine and mixes it rapidly with the acid. The nitro-glycerine formed rises to the surface of the acid, either running off steadily, or drawn off at intervals, through a pipe to the washers. These are placed one above another, so that the nitro-glycerine coming in at the top of one runs out at its bottom to the one below, and so on, a stream of compressed air agitating the water in each. The converting vessel and the various washers can be separated by heavy walls. In the latest form of Kurtz's apparatus, the glycerine is converted into a sort of emulsion by forcing air into it, and this emulsion is blown through a pipe leading to the bottom of the converting vessel by a stream of compressed air. Thus a more rapid and perfect mixture of the glycerine and acid is obtained.

The methods above mentioned are the most important and characteristic ones. Nobel's is the one most used. The apparatus is simple and effective for work on a large scale, and the conversion can be rapidly performed. As in all processes, care must be taken to avoid rise of temperature, but trouble on this score is less liable to occur when operating with large quantities. Mowbray's method involves the use of many vessels, and much handling of small quantities of material, and therefore requires more labor and time, but, with proper care and attention, it is a good working method. Boutmy and Faucher's process, it is claimed, is more free from danger, and gives a larger yield than others, but these claims do not seem to be borne out in practice. The mere process of conversion is practically free from danger, accidents at this stage being extremely rare by any method. A yield of 1.8 parts of nitro-glycerine to 1 of glycerine is claimed for this mode of operating, but this is no better, if as good, as is regularly obtained at the present time by the other plans, and Kurtz asserts that 2.2 to 1 is attainable by his. The peculiarity of this process lies in the previous union of the glycerine with sulphuric acid, so that the heat given off during conversion is less, and the reacting masses can be mixed together at once and not slowly. However, the heat evolved during conversion by the other ways is perfectly controllable without loss of time, while for this process a period of 24 hours is allowed for action, a serious delay and objectionable as leaving the nitro-glycerine, as it is formed, exposed to the action of strong acid for a long time. Kurtz's method is the newest one, and seems to possess some advantages. The action goes on rapidly, and the nitro-glycerine, as fast as it is produced, is removed, and not allowed to collect in the converter or at any time during the operation, thus lessening the chances of extensive explosion, and the nitro-glycerine is not exposed to further action. The difficulty with it in its present shape seems to be that the acid will soon become weakened, when the operation must be stopped to supply fresh acid, or the product will be inferior. But the weakened acid drawn off can be worked up again, and not thrown away, as in other methods,—a considerable economy. The converting vessel must be high enough to insure sufficient exposure of the glycerine to the action of the acid. When this has been attained, it is desirable to remove the nitro-glycerine at once, and this Kurtz's plan permits. It is interesting as the first, though imperfect, attempt at a continuous process, and it promises

to be much used. However, the time is probably not far distant when a really continuous method will be practiced.

Composition and Properties.—There are three possible nitrins or nitro-glycerines, mononitrin, $C_3H_7(NO_2)O_3$, dinitrin, $C_3H_6(NO_2)_2O_3$, and trinitrin, $C_3H_5(NO_2)_3O_3$. The characteristics and conditions of formation of these compounds have not been fully worked out. Probably, as in analogous cases, the two lower ones (mono- and di-) are formed to a greater or less extent when weak acid is used, or the temperature of the reaction is too high, and that trinitrin is the only or principal one formed when proper care is taken. It is usual, therefore, to consider nitro-glycerine as trinitrin, and to give its empirical formula as $C_3H_5N_3O_9$. The equation illustrating its formation will then be—

$$\underset{\text{Glycerine.}}{C_3H_8O_3} + \underset{\text{Nitric acid.}}{3HNO_3} = \underset{\text{Nitro-glycerine.}}{C_3H_5N_3O_9} + \underset{\text{Water.}}{3H_2O}.$$

Nitro-glycerine is a colorless, oily liquid at ordinary temperatures, sp. gr. 1.6, insoluble in water, and having a pungent, aromatic taste. At 40° F., it freezes to a white, crystalline mass. It produces a violent temporary headache if taken into the system, either by placing a drop upon the tongue or on the skin. Persons handling it constantly quickly lose their susceptibility to this action. Pure, well-made nitro-glycerine is stable (does not spontaneously decompose) under ordinary circumstances; if it contains free acid, decomposition is apt to occur which may result in explosion or in the attainment of a state of extreme sensitiveness, so that accidental explosion may be easily caused. Pure nitro-glycerine is not sensitive to friction or moderate percussion, when freely exposed. Placed on an anvil and struck with a hammer, only the particle receiving the blow goes off, scattering the remainder. Completely confined, it may be readily exploded by a blow. Nitro-glycerine may be inflamed and burns slowly. Its firing-point is about 180° C. (356° F.).

Use and Mode of Firing.—Nitro-glycerine is the most powerful explosive agent in use. In its liquid form it is inconvenient and dangerous to handle or transport, so it is not usually employed in that state. It is liable to loss or scattering through leakage of the vessels containing it, which may later give rise to accidents. It may be frozen, and as long as it remains frozen, its transportation is easy and safe, but it must be thawed before using. Thawing is performed by placing the cans containing the explosive in water, at not over 100° F.

The mode of firing is a fuze charged with fulminating mercury, which with certainty accomplishes the detonation of nitro-glycerine. With a gunpowder fuze it is fired with difficulty, and only imperfectly. Frozen nitro-glycerine is less readily and certainly fired than the liquid, even by a fulminate fuze. Since nitro-glycerine is readily detonated, strong confinement is not needed for it.

Products of Decomposition. — On explosion, nitro-glycerine is resolved into gases,—carbonic acid gas, water (steam), nitrogen, and a small proportion of oxygen (Nobel). If the explosion is imperfect, oxides of nitrogen and other bodies are formed.

Nitro-glycerine Preparations. — In order to avoid the disadvantages of the liquid condition, nitro-glycerine may be mixed with various substances (absorbents) to form solid or semi-solid preparations. For most purposes, also, the great intensity of the pure nitro-glycerine explosion is not demanded, while yet a violent explosive is wanted. Therefore preparations containing various proportions of nitro-glycerine find very extensive application as blasting agents, as their cost is moderate, and they are very effective.

Some writers divide the nitro-glycerine preparations into those with an active base and those with an inactive base. Preparations with an active base are those in which the absorbent substance or substances are explosive, so that they take part in the explosion, adding to the force exerted. Nitro-glycerine mixed with gunpowder would give a preparation which would be said to have an active base. Preparations with inactive base are those in which the absorbent is an inert substance, like the earth from which dynamite is made. This classification is unsatisfactory, for, though there are preparations in which the other substances do act with the nitro-glycerine, others are included with them in which such joint action does not occur. It must be remembered, however, that the intermixture of different substances with nitro-glycerine will doubtless affect its explosion, though they do not take part in it.

Dynamite. — The word dynamite is used, to some extent, as a generic term, and it is then made to include all of the mixtures of nitro-glycerine with solid substances. Originally, it applied to one particular preparation, and it is still most used in this sense. This preparation is largely employed for military purposes under the name of dynamite, and in this article it will be the one referred to when that name is used. Dynamite is prepared by mixing nitro-glycerine with a natural silicious earth (kieselguhr), which abounds in many localities. This earth is an extremely fine powder, composed of the skeletons of infusoria. It has high absorptive power, being capable of taking up from 3 to 4 times its weight of nitro-glycerine without becoming pasty. The usual proportions are 1 part of earth to 3 of nitro-glycerine. This gives a soft material, resembling in consistency slightly moist pale brown sugar. Shaken down in a cartridge or case, it has about .9 sp. gr., but may be packed or driven to a sp. gr. of 1.25. From its nearly solid, soft and pulverulent condition, it is much easier and safer to handle than liquid nitro-glycerine, and, at the same time, it contains so large a proportion of that agent that it is a very powerful explosive. It is fired, like nitro-glycerine, by a detonating fuze containing fulminating mercury. Dynamite freezes at the same temperature as its nitro-glycerine, to a more or less compact mass, and when frozen its explosion is accomplished with difficulty, and not with certainty, by a fulminate fuze.

The absorbent capacity of the earth must not be exceeded in preparing the dynamite, in order that exudation may not afterward occur. If flame is applied to dynamite, it takes fire and burns with a strong flame, leaving as residue the silicious earth. If dynamite in large quantity is set on fire, explosion may occur after a part has burned away, but in moderate quantity and not closely confined, inflammation only takes

place. Dynamite is little liable to explosion from sparks, in which respect it is much safer than ordinary gunpowder. Although wetting does not prevent the explosion of dynamite, yet if it is exposed to the prolonged action of water in quantity, the nitro-glycerine will be washed off the particles of silica more or less completely.

Dynamite is sold in the United States under the name of Giant Powder No. 1.

Cellulose Dynamite.—Proposed by Trauzl, an Austrian engineer officer. The absorbent is purified wood-pulp which will take up 3 times its weight of nitro-glycerine. This preparation is said to be capable of resisting the action of water, and that if 20 per cent. of water be added to it, it is still perfectly explosive by a fulminate fuze, although it cannot be inflamed.

Gun-cotton Dynamite.—Glyoxiline.—The first-named is a preparation also brought forward by Trauzl, and is a mixture of damp gun-cotton with nitro-glycerine. Glyoxiline has been made by Abel by allowing the porous masses of compressed gun-cotton to absorb nitro-glycerine.

Explosive Gelatine, or *Gelatine Dynamite.*—This new and very interesting preparation was discovered by Nobel. He found that nitro-glycerine would dissolve the nitro-cellulose known as photographic gun-cotton or collodion cotton, with the production of a gummy or gelatinous substance, in which the nitro-glycerine is very strongly held, and which has very great explosive power. Explosive gelatine may be prepared in two ways: 1. By using a solvent for the nitro-cellulose and mixing the solution with nitro-glycerine. For this purpose methyl alcohol, or the usual mixture of ether and alcohol, may be used. Afterwards the solvent must be removed by evaporation. This operation may be conducted in the cold, but practically it is less serviceable than—2. By dissolving the nitro-cellulose directly in the nitro-glycerine at a moderate heat. A convenient mode of working is to heat the nitro-glycerine in porcelain or enameled vessels of convenient size, standing in a water-bath to about 170° F., adding the required quantity of soluble gun-cotton to the liquid as soon as it has become hot. The mixture should be frequently stirred. Gelatinization takes place quickly, and as soon as it is complete the vessels should be removed from the bath. On cooling, there is obtained a firm jelly free from greasiness. The proportion of soluble gun-cotton used varies from 6 to 10 per cent. of the finished material, depending somewhat upon its solubility. The gelatine has a pale-yellow or yellowish-brown color, is elastic, and can easily be cut or rolled into convenient shapes. It is quite insensitive to blows or friction, and does not give up its nitro-glycerine under action of pressure or of water. An especially powerful fuze is required to explode it when unconfined.

Other preparations may be made by mixing various substances with this gelatine. Of these, camphorated gelatine is the most important. It differs from the simple gelatine in that it contains a small percentage of camphor. This may be conveniently added when the gelatine is made, as camphor is very easily soluble in nitro-glycerine. This camphorated gelatine is extremely insensitive to blows. The impact of a rifle-bullet fired from a distance of 80 feet fails to fire it. It is not affected by water or any temperature attained in practice. Its explosion requires a peculiarly strong fuze, unless it is very strongly confined. Hess states that the Austrian camphorated gelatine (4 per cent. of camphor) is for equal weights 25 per cent. stronger than dynamite or compressed wet gun-cotton, and for equal bulks has 40 per cent. advantage in strength over the dynamite and 75 per cent. over gun-cotton. In many respects, therefore, explosive gelatine seems to be peculiarly suitable for military purposes.

Other Preparations.—Many other nitro-glycerine mixtures are made for use in blasting, which are not very suitable for military service, and need not be discussed here. They contain usually from 20 to 50 per cent. of nitro-glycerine, mixed with various absorbents, ordinarily the ingredients of gunpowder or similar substances. Of these may be mentioned, as used in the United States, Dualin, Giant Powder No. 2, Hercules Powder (contains magnesium carbonate), Rendrock, Vulcan Powder, etc.; in Europe, Dynamite No. 2, Lithofracteur, Lignose, Colonia Powder, Brains Powder (contains a chlorate), etc.

GUN-COTTON.—*Syn.* Nitro-cellulose; Pyroxylin.

Schönbein, in 1845, stated that he had prepared an explosive substance from cotton. He kept his process secret until it had been discovered also by Böttger, Otto, Knopp, and Taylor. In France, England, Germany, and Russia, attempts were made to manufacture and use the new agent, but not with satisfactory results. By the method of manufacture employed, the liability to spontaneous decomposition was not removed, and consequently many accidents were experienced with it. In Austria, the use of gun-cotton was kept up for a number of years after it had been given up by other governments. This was due to the improvements in the methods of making, which were devised by Von Lenk, an Austrian officer. It was employed in shells and in field-guns. While it was found to be a very serviceable agent, yet its dangerous instability still gave trouble, and after a severe accident in 1862, its manufacture was largely given up, its use being limited to certain engineering purposes, and in 1865 its making was stopped altogether in Austria. In 1865, Abel introduced his process by which the quality of the gun-cotton was so much improved that the previous obstacles to its extensive use seemed to have been altogether removed. It therefore grew in favor, until the severe accident at Stowmarket, England, in August, 1871. Investigation into the causes of the accident showed that the explosion was not due to any defect in the method of preparation of the gun-cotton, or to its instability, so that confidence was again felt in it. Afterward, it was discovered that Abel's compressed gun-cotton could be violently exploded when wetted, or even saturated, with water. In this way was obtained an explosive agent of great power, as well as one having a high degree of safety. In consequence, compressed gun-cotton has been largely adopted by European governments as a military explosive, particularly for torpedo purposes. It possesses many advantages for such employment, but for blasting the nitro-glycerine

preparations are preferred, as more convenient to use and more easily exploded.

Formation and Mode of Manufacture.—Gun-cotton is formed by the action of concentrated nitric acid on cotton or cellulose. Cotton being nearly pure cellulose is the best material for this purpose. The method of making consists essentially in exposing the cotton for a sufficiently long time to the action of a mixture of strong nitric and sulphuric acids, and in thoroughly washing the product. As in the nitro-glycerine reaction, the sulphuric acid does not take any direct part in the formation of the gun-cotton, but takes up the water, which is a by-product.

Abel's Process.—Cotton-waste is the form of cotton used. It is picked, cleaned, and dried. The acids are the strongest nitric and sulphuric acids, mixed in the proportion of one part of the former to three of the latter. Cotton in one-pound charges is immersed in the acid mixture, which is contained in a trough surrounded with cold water. After a short exposure to the action of the acid, the cotton is taken up, placed upon a perforated shelf, and as much as possible of the acid squeezed out from it. It is then put into jars, covered with fresh acid, and the jars placed in cold water, where they remain for 24 hours. The gun-cotton from the jars is thrown into a centrifugal strainer, which expels from it nearly all of the acid. It is then diffused quickly in small quantities through a large volume of water, and again passed through a centrifugal machine. Thorough washing is necessary to remove the traces of acid still adhering to the gun-cotton. The washing is expedited and rendered complete by the operation of pulping. The pulping is performed in pulping-engines, or beaters. A beater is an oblong tub, in which is placed a revolving wheel carrying strips of steel on its circumference. From the bottom, under the wheel, project similar steel strips. By the rotation of the wheel, the gun-cotton suspended in water circulates around the tub, and is drawn between the two sets of steel projections, which reduce it to a pulp. The bottom is movable, so that the space through which the gun-cotton must pass may be contracted as the operation goes on. When the pulping is complete, the contents are run into the poachers for the final washing. A poacher is a large, oblong wooden tub. At the middle of one side is placed a wooden paddle-wheel, which extends half-way across the tub. In the poacher, the pulp is stirred for a long time with a large quantity of water. The revolution of the wheel keeps up a constant circulation, and care is taken that no deposit occurs in any part of the tub.

The pulp is next to be separated from the large volume of water in which it is suspended, and compressed into cakes or disks. This is accomplished in two presses. The first press has thirty-six hollow cylinders, in which perforated plungers work upwards. The plungers having been drawn down, the cylinders are filled with the mixture of pulp and water, and their tops covered with a weight. The plungers are then forced up by hydraulic power. The pulp is compressed, the water escaping through the perforations in the plungers.

In the second press, the cylindrical masses of gun-cotton from the first press are more highly compressed, a pressure of six tons to the inch being applied.

About 6 per cent. of water remains in the cakes, which is usually increased to 20 or 25 per cent. before storing the material. A variety called granulated gun-cotton is prepared without pressing, by making the pulp into small grains or balls.

In this process, while care is taken to insure complete conversion, still the essential feature is the thorough washing accomplished. This is rendered possible by the pulping operation by which the fibres are torn into shreds, thus facilitating their rapid, as well as thorough, purification.

Composition and Properties.—There are a number of varieties of nitro-cellulose. Of these only one is used as an explosive agent. It is derived from the fullest action of the nitric acid upon the cellulose. The others are less explosive, although very inflammable. Some of the less nitrated products are largely used for making collodion for photographic and medical purposes, for celluloid, etc. The composition of the explosive gun-cotton, or tri-nitro-cellulose, may be expressed by the formula $C_6H_7N_3O_{11}$, and the equation illustrating its formation will be—

$$\underset{\text{Cellulose.}}{C_6H_{10}O_5} + \underset{\text{Nitric acid.}}{3HNO_3} = \underset{\text{Tri-nitro-cellulose, or Gun-cotton.}}{C_6H_7(NO_2)_3O_5} + \underset{\text{Water.}}{3H_2O}.$$

The appearance of the cotton is very little changed, by the operation of conversion. Gun-cotton is insoluble in and unaffected by water. If flame is applied to dry, loose gun-cotton, it flashes off; dry compressed gun-cotton burns rapidly but quietly if unconfined, and moist compressed gun-cotton slowly, under the same circumstances. If a large quantity of compressed gun-cotton is inflamed, the explosion of a part may be produced after the remainder has burned away. The outer portion confines the inner, and it becomes heated to the point of explosion. Dry, loose gun-cotton is not detonated by fulminating mercury, but if packed in small compass, and especially if highly compressed, the violent explosion is readily produced. Fulminate will not explode wet, compressed gun-cotton. To accomplish this there is required the detonation of a small quantity of dry, compressed gun-cotton, itself detonated by a fulminate. Gun-cotton is not sensitive to friction or percussion. Well-made and thoroughly washed gun-cotton is stable, but if free acid has been allowed to remain in it, or if it is contaminated by the lower products, spontaneous decomposition may result. The firing-point of gun-cotton is about 360° F.

Use and Mode of Firing.—Gun-cotton was formerly used for artillery by spinning and weaving the fibre into ropes or webs, from which cartridges were made. At the present time the compressed is the only kind made, and this is, of course, not suited for artillery. Compressed gun-cotton is usually made in disks from 1 to 6 inches diameter, but any other shape can be as easily made. For torpedo purposes, it is pressed into forms which will fit the cases to contain it.

Compressed gun-cotton is always stored and used wet. It is then the safest explosive agent known. In order to explode it when in this

condition, a special "primer" is necessary, which is composed of dry compressed gun-cotton with a fuze charged with 25 grains of fulminating mercury firmly attached to it. This primer must be water-proof, although the main charge may be freely exposed to water.

Gun-cotton, either as pulp or compressed, is well fitted for bursting charges for shells.

Products of Decomposition.—On explosion, gun-cotton is almost entirely converted into gases, only a trifling residue being left. The gases formed are carbonic acid, carbonic oxide, water (converted into steam by the heat of the reaction), nitrogen, and a small amount of marsh gas (Karolyi).

The combustion is not so complete as when nitro-glycerine is fired. The latter contains more than oxygen enough to oxidize all its carbon and hydrogen to carbonic acid and water, while the quantity in gun-cotton is insufficient to do this, and a considerable proportion of carbonic oxide is formed. This does not much affect the volume of gas formed, but the heat evolved is considerably less than if the oxidation of the carbon was more complete.

Gun-cotton Preparations.—Nitrated Gun-cotton.—This is made by soaking the dry compressed gun-cotton in a saturated solution of saltpetre (potassium nitrate), and drying.

Chlorated Gun-cotton.—This is similarly made, using potassium chlorate instead of nitrate.

Tonite, or *Cotton Powder.*—This is a mixture of finely divided gun-cotton with barium nitrate.

THE FULMINATES.—The fulminates are salts of fulminic acid ($C_2H_2N_2O_2$). The mercury salt is the only one of practical value. All of them are easily exploded, and some are excessively sensitive.

Fulminating Mercury.—Fulminating mercury has the composition indicated by the formula $C_2HgN_2O_2$. It is formed by the action of mercuric nitrate and nitric acid upon alcohol. The best mode of preparing it is as follows:

Dissolve 1 part of mercury in 12 parts of nitric acid, sp. gr. 1.3, and pour this solution into 11 parts of alcohol, 85 per cent. Place the vessel containing the mixture in hot water until it darkens and becomes turbid, and begins to evolve dense white fumes. It is then removed from the water. The reaction goes on, with strong effervescence and copious evolution of dense, white, ethereal vapors. If red fumes appear, cold alcohol should be added to check the violence of the action. The operation should be performed at a distance from a fire or flame, and in a strong draft, so that the vapors will be carried away. When the liquid clears and the dense white fumes are no longer given off, further action is stopped by filling up with cold water.

The fulminate settles to the bottom of the vessel as a gray, crystalline precipitate. The supernatant liquid is then poured off, and the fulminate washed several times by decantation or upon a filter.

Properties and Uses.—Dry fulminating mercury explodes violently when forcibly struck, when heated to 186° C. (367° F.), when touched with strong sulphuric acid or nitric acid, by sparks from flint and steel or the electric spark.

When wet it is inexplosive. It is therefore always kept wet, and dried in small amounts when wanted for use.

Its explosive force is not much greater than that of gunpowder, but it is much more sudden in its action, so that it produces violent local effects.

The readiness with which it may be fired makes it an excellent means of causing the explosion of other substances, and it is for this purpose only that it is used. It finds many applications,—either pure or mixed with other bodies,—in percussion-powder, percussion-caps, primers, fuzes, detonators, etc. It presents many advantages for this use. It is of special importance for the peculiar power it possesses of causing the violent explosions called detonations. It is, therefore, a requisite for exploding nitro-glycerine, gun-cotton, and their preparations.

Detonators or detonating fuzes are charged with pure fulminating mercury,—15 to 25 grains in each. Fifteen grains is a sufficient charge for nitro-glycerine or its preparations; one of 25 grains is used with compressed gun-cotton.

Fulminating Silver.—This salt has a similar composition to, and is prepared like, fulminating mercury, using silver nitrate instead of mercuric nitrate. It must be handled with the greatest caution, as it is extremely sensitive, exploding when dry on slight provocation and even when wet, although then requiring a harder blow than if dry.

THE PICRATES.—The picrates are salts of picric acid. Picric or trinitrophenic acid is formed by the action of nitric acid on carbolic acid (phenol, C_6H_6O). Three products may be derived from this action, but only one, picric acid, possesses any marked explosive properties.

Picric acid has the composition indicated by its formula,—$C_6H_3(NO_2)_3O$, or $C_6H_3N_3O_7$. Picric acid is found in commerce, being used to dye silk and wool yellow. If the acid is heated, it takes fire and burns sharply and rapidly, without explosion. The picrates are all exploded with more or less violence by heat or blows. When used as explosive agents, they are mixed with potassium nitrate (saltpetre) or potassium chlorate.

A large number of picrates are known, but the potassium and ammonium salts are the only ones that have been much used in explosive preparations.

Potassium Picrate. $C_6H_2KN_3O_7$.—Most violently explosive of the picrates. Potassium picrate and potassium chlorate form a mixture nearly as powerful as nitro-glycerine, but it is so sensitive to friction or percussion as to render it practically useless. With potassium nitrate instead of chlorate, a less violent mixture is obtained, but one still too liable to accidental explosion.

Ammonium Picrate. $C_6H_2(NH_4)N_3O_7$.—This salt has been employed by Brugére and by Abel with saltpetre in the preparation of certain explosive mixtures. Brugére claims for such a powder, that it is less hygroscopic than gunpowder, and that it is more powerful and more uniform in its effects.

Abel's Picric Powder has been used in England for bursting charges for shells. It is prepared by the usual gunpowder processes, and has the same form as that agent. It is not affected by blows or friction, and is as safe and perma-

nent as gunpowder, and is fired in the same way.

A good powder may be made from ammonium picrate, saltpetre, and a small proportion of charcoal. The charcoal serves to bind together the other ingredients, and there is obtained a mixture which can be easily incorporated, pressed, and granulated. Experiment with this powder has shown that it may be serviceable as a substitute for gunpowder, when greater violence is wanted, and neither gun-cotton nor nitro-glycerine is available or suitable. It is handled and fired like ordinary gunpowder, and does not absorb moisture more readily.

EXPLOSIVE MIXTURES.—The general composition of these explosive agents has been already considered. Many of them contain a nitrate or nitrates, in most cases potassium or sodium nitrate or both. These salts are mixed with combustible substances in varying proportions, according to the use for which the explosives are wanted. From charcoal, sulphur, and potassium (or sodium) nitrate are prepared the numerous varieties of war, sporting, and blasting powders. They are essentially alike in their mode of action, and may all be included under the general title of gunpowder. The explosive mixtures which are not classed under gunpowder are of but comparatively little importance and require but brief mention.

Schultze's Powder is made by converting purified woody fibre (sawdust) into nitro-cellulose, by treatment with nitric and sulphuric acids, washing, drying, and mixing with saltpetre by soaking the grains in a saturated solution of the salt, and again drying. It is intended for use in small-arms. A similar powder is made in the United States by Dittmar, for sporting purposes.

Barium nitrate has been occasionally used to replace saltpetre, as in the preparations called Saxifragin and Wynant's Powder, but with no especial success.

Mixtures containing potassium chlorate form a separate class. They are characterized by great readiness and sharpness of explosion. They are sensitive to blows or friction, so much so that they are of but little value as explosive agents. The principal preparations of this kind are—

German, or *White Gunpowder*, *Reveley's Powder*.—Potassium chlorate with potassium ferrocyanide (yellow prussiate of potash), or with sugar as a third ingredient.

Horsley's Powder.—Potassium chlorate and powdered nut-galls. When this powder is used as an absorbent for nitro-glycerine, the mixture resulting is called Horsley's Powder No. 2.

Erhardt's Powder.—Potassium chlorate and tannin with powdered coal, sometimes used as a diluent.

Powder used in "chemical fuzes."—Potassium chlorate and sugar, or sugar and nut-galls.

Oriental Powder.—Potassium chlorate and powdered gambier.

Pertuiset Powder.—Potassium chlorate and sulphur. Used in explosive bullets.

Sprengel's Nitric Acid and *Potassium Chlorate Mixtures*.—Sprengel has found that there are many organic substances which dissolve in concentrated nitric acid, forming explosive mixtures. Nitro-benzole, or picric acid, will give a liquid which can be violently exploded. These solutions contain strong nitric acid, so that they are inconvenient to handle or use.

He also proposes a kind of chlorate mixture which avoids the usual dangers of such preparations. The mixing of potassium chlorate with solid combustible substances (the usual method) is a dangerous operation, and the mixture is very sensitive. Sprengel allows cakes or lumps of the chlorate to absorb combustible liquids, which is readily done without danger. If the liquid taken up contains a nitro-compound, or one containing sulphur, the mixture can be exploded by a fulminate; but if not, then the detonator must be surrounded by an envelope of gun-cotton. Carbon disulphide, nitro-benzole, benzine, petroleum, are examples of combustible liquids which may be used in this way. Sprengel claims for these mixtures cheapness, power, and safety.—*Walter N. Hill.* See GUNPOWDER.

Export. To send goods out of a country.

EXPORTS. Goods sent out of a country. See BALANCE OF TRADE, COMMERCE, CUSTOMS.

Extreme Breadth. The widest part of the ship, including the thickness of the planking.

Eye. A loop or ring. The *eye* of a shroud is that part that goes over the mast-head. The *eye* of an anchor is the hole in which the ring is inserted. *Eyes of a ship*, or the *eyes of her*, the hawse-holes; they were formerly frequently painted to represent eyes; the Chinese always paint an eye on each bow of their craft. The term is also applied to those parts of a ship which lie near the hawse-hole, particularly in the lower apartments within the vessel.

EYE, ARTIFICIAL, or SPINDLE. A neat eye for the end of a stay, and sometimes used for the lower end of man-ropes.

EYE-BOLT. A bolt with an opening in the head to which a tackle may be hooked.

EYE, FLEMISH. An eye used for the collar of a stay. It is not strong, soon rots, and is seldom used where strength is more important than neatness. The name is sometimes applied to the artificial eye.

EYELET-HOLES. Small circular holes in a sail through which are thrust the reef-points, robands, etc.

EYE, ROPE-MAKER'S. An eye formed in the end of a cable in laying it up. Two of the strands are two legs of a rope, and when laid up they form an eye; the third strand is then also formed into an eye.

EYES, LASHING. Eyes formed in two parts of a strap of a block, or in end of a stay, which are connected by a lashing.

EYE-SORE. Any disagreeable object.

EYE-SPLICE. A kind of splice made by turning the end of a rope back and passing the ends of the strand through the standing part. The *eye of a splice*, the strand raised up by the marlinspike to receive the opposite strand.

Eyght. An alluvian river-island; called also *ait*, *ayt*, *ey*, *eyet*, or *eyot*.

F.

F. Of the letters used in the log-book to indicate the state of the weather, *f* denotes *fog*.

Face. A flat surface; as, the face of the muzzle, face of a valve, etc. To trim the cuffs, collar, etc., of a garment with a protective or ornamental covering.

Face-piece. The letting of one piece, which is thinner, into another in order to strengthen it.

Formerly, it was a term used in making the knee which formed the cut-water of the ship, and was defined as a piece of oak generally tabled into the forepart of the knee of the head, to assist in the conversion of the main piece, and likewise to shorten the upper bolts, and prevent the cables from rubbing against them as the knee gets worn.

Facing. A piece of cloth sewed on a garment as a protection or ornament.

Factor. An agent, transacting business for others, and empowered to buy and sell at his own discretion.

Factorage. The allowance, percentage, or commission paid to a factor.

Factory. A house or quarter where factors reside. The body of factors in a country. A manufactory, mill, or workshop.

Faculæ. The bright streaks on the sun's disk, in which appear the *maculæ* or dark spots.

Fadome. Old form of *fathom*.

Faff. To blow in puffs.

Fag. To beat. *To fag out*, to untwist or become frayed; as, the end of a rope, or the edge of canvas.

Fag-end. The frayed end of a rope. The small remaining part of anything.

Faggot. A man hired to answer to names in a false muster.

Fagot. A billet of wood used in stowing cargo.

Fahrenheit, Gabriel Daniel. The inventor of the mercurial thermometer. He was born in Dantzic in 1686. In 1714 he conceived the idea of substituting mercury for spirits of wine in the construction of thermometers. He took as the zero of his thermometric scale the lowest temperature observed by him at Dantzic, in the year 1709, which he found was that produced by mixing equal quantities of snow and sal-ammoniac, and which he probably supposed was the absolute zero of temperature. The space between this point and that to which the mercury rose at the temperature of pure boiling water he divided into 212 parts or degrees. This scale, though now in common use, will eventually be superseded by the centigrade scale of Celsius. It is denoted by the abbreviation "F." or "Fahr."

Faik, or Falk. A name for the razor-bill (*Alca torda*).

Fair. Plain; favorable; unobstructed. Applied to the weather, clear or cloudless; to the wind, favorable or propitious; to timbers, when they are trimmed to fit exactly.

Fair Curve. In delineating ships is a perfectly fair line applied to any portion of the ship's surface.

Fairing. In ship-building is making a curved surface on any part of a ship perfectly true, or parts of perfect arcs.

Fair Lead. A rope has a fair lead when it does not suffer chafe from obstruction.

Fair-leader. A block or thimble of wood or metal, placed to give a rope a fair lead, or to change its direction slightly. Fair-leaders are generally made of hard wood, as lignum-vitæ, and have one, two, or three holes in them, according to the number of ropes to lead through them. One or two scores are cut in one side for the shroud or stay which they are to embrace, and two smaller scores at right angles to these for the seizings to hold them in place. Also, a board or rail with holes through which ropes lead.

Fair Plate. Has reference to the plating of iron ships, and is a term used when the plate has been finished in perfectly fair or evenly true lines.

Fair-way. The middle of the navigable channel of a river, strait, or harbor, etc. The proper course through a channel.

Fair Weather. Weather in which the light sails may be carried.

Fair-weather Friend. A friend when fortune smiles, but who deserts you in the days of adversity.

Fair-weather Sailor. The nautical equivalent of *carpet-knight*.

Fairfax, D. M., Rear-Admiral U.S.N. Born in Virginia. Appointed midshipman from North Carolina, August 12, 1837; sloop "John Adams," East Indies, 1837–40; at the destroying of towns on the west coast of Sumatra, in 1839; ten months in sloop "Fairfield" and frigate "Brandywine," Mediterranean, in 1841–42; Naval School at Philadelphia, 1842–43.

Promoted to passed midshipman, June 29, 1843; attached to steam-frigate "Missouri" until she was destroyed by fire at Gibraltar, in 1843; coast survey, in 1844; brig "Porpoise," 1845; transferred, after four months, to frigate "Columbus," East India and Pacific Squadron, 1845–47; in store-ship "Erie," Pacific Squadron, for four months, and transferred to sloop "Cyane," 1847–49; at the attack and capture of several towns on the west coast of Mexico, under Commander Dupont; frigate "Congress," Brazil Squadron, 1850–53.

Commissioned as lieutenant, February 26, 1851; frigate "Potomac," Home Squadron, 1855–56; transferred to frigate "Wabash," and continued in her during 1856–58; at capture of Walker's expedition, at San Juan, Nicaragua; steamer "Mystic," in 1859; "Constellation,"

1859–60; "San Jacinto," 1860–61, coast of Africa; while in the last named, directed in person the taking from the "Trent" of Messrs. Mason and Slidell; commanding steamer "Cayuga," Mississippi Squadron, in 1862, under Admiral Farragut; skirmishing along its banks and keeping river open as far as Red River.

Commissioned as commander, July 16, 1862; commanding monitor "Nantucket," South Atlantic Blockading Squadron; attack on Charleston forts, April 7, 1863; commanding "Montauk," in night and day work at Charleston, until August 25, 1863; commandant of midshipmen, at the Naval Academy, 1863–65; commanding Practice Squadron, two seasons.

Commissioned as captain, July 26, 1866; commanding steamer "Rhode Island," flag-ship North Atlantic Squadron, 1866; commanding flag-ship "Susquehanna," same squadron, 1867–68; on ordnance duty at different periods, at Philadelphia, New York, and Boston; executive-officer of navy-yard, Portsmouth, N. H., 1870–72.

Commissioned as commodore, August 24, 1873; commanding Naval Station, New London, Conn., 1873–76; special duty, 1876–77; commandant Naval Station, New London, 1877–78. Total sea-service 22 years and 4 months; shore duty, 15 years. Special duty Washington, D. C., 1879. Governor Naval Asylum, Philadelphia, 1880. Commissioned as rear-admiral, July 11, 1880.

Fajardo. On the east coast of the island of Porto Rico, 5 miles S. of the N.E. angle of that island; has a fine harbor, telegraph-lines to other West Indian ports and the United States. Pop. 3500.

Fake. One complete circle of a rope in a coil. A number of such turns make a *tier* or *sheave*, and several tiers superimposed, a *coil*. *To fake* a rope is to coil it down carefully, in opposition to *coil*, to perform the work loosely or hastily. See FLEMISH, FRENCH-FAKE.

Falcon. An ancient and mediæval gun. There were various sizes, throwing balls of from 1 to 6 pounds. They were about 25 or 30 times their calibre in length (7 to 8 feet).

FALCONET. A mediæval piece of ordnance having a ball of ½ to 3½ pounds smaller in calibre than a falcon.

Falconer, William, was born in Edinburgh about 1730. He went early to sea, and before he was 18 years of age was second mate of a vessel in the Levant trade, which was wrecked off Cape Colonna, himself and two others being the only portion of the crew saved. He published "The Shipwreck" in 1762, and during the next year he entered the navy as midshipman in the "Royal George." When peace came he resided in London, where he wrote a satire on Wilkes, and compiled a "Nautical Dictionary." He was again at sea in September, 1769, as purser in the "Aurora" frigate, and perished with his companions when the vessel sank in the Mozambique Channel.

Fall. To descend by the force of gravity. To lessen; to diminish. To happen; to come to pass. A precipitous descent of water. A break in a deck. The rope of a tackle or purchase. The ebb of the tide. *To fall aboard of*, to come into collision with another vessel, either by design or by the mismanagement of the vessel. *To fall astern*, to drop behind. *To fall back*, to give way; to recede. *To fall calm*, to become calm. *To fall down*, to sail or drift down to another position. *To fall foul of*, the same as *to fall aboard of*. *To fall in with*, to meet a vessel; to make the land. *To fall home*, to project within the perpendicular, said of the top-sides,—the same as *to tumble home*. *To fall off*, to pay off to leeward. *Fall not off!* Keep the ship up to her course! *To fall out*, the opposite of *to fall home* (which see).

FALLEN STAR. A name for the jelly-fish (*Medusa*), thrown up on a beach.

FALLING GLASS. The descending of the mercury in the barometer.

FALLING STAR. A shooting-star. See AEROLITES.

FALLING TIDE. The ebb-tide. See TIDE.

FALLS. The descent of a deck from a fair curve, lengthwise, to give height to a cabin, as in yachts, small sloops, and schooners.

FALL WIND. A sudden gust.

Fall! A Fall! A cry to signify that the harpoon has been firmly imbedded in the whale.

Fall Cloud. See CLOUD.

Fall River. A large manufacturing city and port of entry of Bristol Co., Mass., on the east bank of the Taunton River at its mouth, and on Mount Hope Bay, which is the northeastern arm of Narragansett Bay, 49 miles south of Boston, 19 miles N.N.E. of Newport, R. I. Large steam-packets ply daily between Fall River and New York. It is specially noted for its manufactures of cotton, for which there are 40 mills. The harbor is safe, capacious, and deep enough to admit vessels of the largest class. Pop. 44,500.

Falmouth. A seaport town on a branch of the estuary of the Fal, in Cornwall Co., England. Lat. 50° 8′ 8″ N.; lon. 5° 2′ 7″ W. The harbor is formed by the estuary of the Fal, and is about 5 miles long by 1 mile broad. The entrance is defended by Pendennis and St. Mawe's Castles, both built in the reign of Henry VIII., and the former contains large barracks, magazines, etc. Its position at the mouth of the English Channel rendered Falmouth for many years a principal station for the foreign mail service, and it is still a great resort for shipping. Pop. 5500.

False. Not genuine; feigned.

FALSE ALARM. See ALARM.

FALSE ATTACK. A feigned attack, to draw away the attention of the enemy.

FALSE COLORS. An ensign or colors other than that the vessel is entitled to carry. As a stratagem, the carrying of false colors is allowed; but no gun should be fired until the proper ensign is substituted.

FALSE FIRE. A composition in a wooden tube, which burned with a light blue flame from a half to several minutes. It was principally used as a night-signal, but often to deceive an enemy.

FALSE KEEL. A plank from 4 to 6 inches in thickness, which is put on and bolted to the main keel with short bolts, so that, in the event of the ship striking bottom, the false keel may be wrenched off without disturbing the main keel; it also enables the sailing ship to hold a better wind.

FALSE MUSTER. An incorrect statement of the number of people borne on the ship's books. A quaker or wooden gun.

False Papers. Documents carried by a ship declaring her to be what she is not, representing her cargo, destination, nation, etc., falsely, for the purpose of deceiving a searching-party. A vessel with false papers is a lawful prize.

False Post. A piece of timber tabled and secured to the after-side of the main post, to make good a deficiency in size.

False Rail. A rail fayed down upon the upper side of the main or upper rail of the head; it is to strengthen the head-rail.

False Stem. The same as the term fore-foot, the forward lower piece of the stem, and secured to the stem in a manner similar to the method of securing the false keel with short bolts.

False Stern. A stern built on the original ship or yacht, thereby altering its shape, without destroying the original vessel.

False Tabling. A tabling, or piece of canvas, sewed on the sides of a cut in an awning or screen.

False Point. A port of India, on the Bay of Bengal, Cuttack District. Lat. 20° 20′ N.; lon. 86° 47′ E. It has the best harbor between Calcutta and Bombay, safe, roomy, and accessible to all ships. It communicates by canals with the interior of Orissa.

Family-head. A figure-head composed of several full-length figures.

Fan. To widen.

Fanal (*Fr.*). A light-house.

Fancy-line. A line leading through a thimble in the mizzen rigging or top, and having another thimble near the end, through which the hauling part of the main brace leads, the end beyond being secured to the standing part of the brace. A line rove through a block at the jaws of a gaff, used to haul it down. A line used to overhaul a lee topping lift.

Fane. An old term for weather-cock. See Vane.

Fang. To prime a pump. The valve of a pump. The bend of a rope.

Fanion. A small flag used to mark the stations in surveying.

Fanning Along. Moving along very slowly with the sails alternately swelling and collapsing.

Fanning-breeze. A very light breeze, just sufficient to give a ship steerage-way.

Fan-tod. A name given to a nervous, fidgety officer.

Far-cost. A Scotch coasting-vessel.

Fardage. Dunnage, when laden in bulk.

Fare. Sum paid for conveyance by water. A fishing-seine for cod. A cargo of cod.

Faro. A seaport of Portugal, in Algarve, on the Valfermosa, near the south coast, 20 miles southwest of Tavira. Among the principal buildings are the military hospital, arsenal, and custom-house. Pop. 8210.

Farragut, David Glasgow, Admiral U.S.N., was born at Campbell's Station, near Knoxville, Tenn., July 5, 1801.

His father, who was descended from a distinguished family of the island of Minorca, emigrated to America, and entered the colonial army. He married in North Carolina and settled in Tennessee, but subsequently drifted to Louisiana, and entered the naval service as a sailing-master. Here an acquaintance arose between him and the celebrated Commodore David Porter, in whom young Farragut found a valuable friend.

He was appointed midshipman, December 17, 1810, served in the frigate "Essex" in her eventful cruise in the Pacific, and at the age of 13 was placed in command of one of her numerous prizes. In the battle between the "Essex" and the British ships "Phœbe" and "Cherub" (March 28, 1814), which resulted in the capture of the former, Farragut was slightly wounded, and received the commendation of his commander, who regretted that he was "too young for promotion." The story of the pig, which he tells in his journal, is not merely amusing, but suggests that some characteristics of the future commander were already pretty well developed in the boy. After the battle, a young reefer of the "Phœbe" was carrying off a pet pig, when Farragut claimed it as private property, and determined not to let it go. The oldsters cheered his pluck, made a ring, and declared that the winner of a fair fight should have the pig. This was quickly decided in favor of the young American, whose physical education had been exceptionally good. "So," says Farragut, "I took Master Murphy under my arm, feeling that I had in some degree wiped out the disgrace of our defeat."

With the remainder of the crew of the "Essex," he returned to the United States in the "Essex, Jr." (a captured whaler).

After peace was declared he received orders to the "Independence," 74, bearing the broad-pennant of Commodore Bainbridge, and intended to take part in the Algerine war; but Decatur succeeded in forcing the bey to terms before the ship's arrival in the Mediterranean.

Farragut made a second cruise to the Mediterranean in the "Washington," under Commodore Chauncey, and his journal of observations at this period of his career is extremely interesting. Through the interposition of the chaplain of his ship, Mr. Charles Folsom, who had been temporarily appointed consul at Tunis, Farragut had an opportunity to study and travel in the interior.

In 1823–24 he served under his old commander, Porter, in the Mosquito Fleet, fitted out for the suppression of piracy in the West Indies, took part in a small affair against the pirates at Cape Cruz, and had some romantic and ludicrous adventures in chasing them to their haunts on shore. He considered his experience in the Gulf as of great service to him professionally, and looked with pride upon the fact of his getting command of the schooner "Ferret" at the age of 22.

In January, 1825, he was attached to the "Brandywine," the vessel to which was assigned the duty of conveying Lafayette home to France after his visit and tour in the United States.

He served on the Brazilian station up to the close of 1837 as executive-officer of the "Delaware," and in command of the "Boxer" and "Decatur."

While in command of the sloop "Erie" at Vera Cruz he witnessed the bombardment of the castle of San Juan de Ulloa by the French naval forces (1838), and being always an enthusiastic observer of matters relating to his profession, he took notes of the action. At the breaking out of the war with Mexico (1846) he was

anxious to turn this experience to good advantage, remarking that in making his notes he had not looked forward to a war with Mexico, but had made it a rule of his life to note such things with a view to possible use in the future. After urgent solicitation he obtained command of the "Saratoga" (March, 1847), but too late to do more than to see some hard service on the blockade of Tuxpan.

After his return home (February, 1848) he was variously employed on ordnance, court-martial, and navy-yard duties.

In 1854 he was sent to the Pacific coast to establish the navy-yard at Mare Island, Cal. The four years passed here were uneventful, with the exception of the organization of the "Vigilance Committee" of 1856. Farragut's coolness and judgment in dealing with a delicate question of Federal and State jurisdiction not only saved the government from being drawn into a local quarrel, but prevented bloodshed.

In 1859–60 Farragut commanded the "Brooklyn" in the Gulf of Mexico, part of the time on special service with the American minister, Hon. Robert McLane.

At the breaking out of the civil war he was residing at Norfolk, Va., his adopted home. Being a man of broad national views, he promptly announced his allegiance to the Union, moved to the North, and after some delay was assigned to the command of the Western Gulf Squadron, January, 1862.

His passage of Forts Jackson and St. Philip, the defenses of New Orleans (April 23–24, 1862), in his fleet of wooden ships, was a grand achievement in naval warfare, at a time when the theory of the superiority of forts over ships was everywhere asserted. He seemed confident of success from the first. "As to being prepared for defeat," he wrote, "I certainly am not. Any man who is prepared for defeat would be half defeated before he commenced. I hope for success, shall do all in my power to secure it, and trust to God for the rest." And with his gallant officers and men he succeeded in passing the barrier of hulks, logs, and chains, and forts, destroyed the enemy's flotilla, and placed New Orleans under his guns.

As soon as possible he pushed on up the river to carry out his orders to open the Mississippi, and successfully passed the batteries of Vicksburg (June 28, 1862); but the great elevation of the batteries, and the absence of a co-operating land force of sufficient strength, rendered this movement of little real importance. His vessels on the coast of Texas, however, succeeded in capturing Galveston and Sabine City.

On March 14, 1863, in attempting a bold dash past the batteries of Port Hudson, a portion of his fleet was compelled to retire, and one of his ships —the "Mississippi"—was destroyed. But with his flag-ship and one small gunboat he continued on up the river, penetrating as far as Vicksburg, and finally established a blockade between Red River and Port Hudson. On the arrival of Porter from above, he returned to New Orleans by the Atchafalaya, and conducted the naval operations of the siege of Port Hudson until its surrender, July 8, 1863.

His most brilliant achievement was in passing Forts Morgan and Gaines, at the entrance to Mobile Bay, August 5, 1864. In this encounter he captured the ram "Tennessee" and gunboat "Selma." The forts subsequently surrendered to the combined naval and military forces. In this engagement he showed his decision of character in taking the lead in his flag-ship at a moment when disaster seemed certain. The dramatic incident of his viewing the conflict from a lofty position in the rigging, where he had allowed himself to be secured by a lashing of rope, has been authenticated by an autograph letter of Farragut's (September 25, 1864), in which he says, "I told you that Watson brought me the rope to tie myself in the rigging. So he did; but Drayton sent one up by the quartermaster when I was up in the *main* rigging. I was so much interested in what was going on around me that I hardly noticed it, but took it mechanically, and fastened it to the shrouds and around myself."

He received the thanks of Congress, and was commissioned rear-admiral July 16, 1862, and vice-admiral Dec. 21, 1864, and was finally promoted to the rank of admiral, July 25, 1866.

In 1867, in command of the European Squadron, he made an extended cruise in the "Franklin," and was received with marked attention at the European capitals.

Farragut had a high reputation in the service for industry, character, and efficiency. He was physically and morally brave and essentially modest, though with a pleasant appreciation of his attainments. His education in some respects was remarkable. He was an indefatigable reader, and spoke several languages. Among intimates his humor was proverbial. The purity of his domestic life was as unsullied as his professional career; there was nothing in either that required explanation or apology. His plans of battle appeared simple enough, but showed a thorough, minute, and painstaking preparation. His quickness of perception and resolution in the midst of conflict were his strongest points.

He died at Portsmouth, N. H., August 14, 1870. His remains were subsequently borne to Woodlawn Cemetery, Westchester Co., N. Y. (September 30), with great ceremony, where they now rest under a monument erected by his widow and son.—*Loyall Farragut.*

Farthel. An obsolete word for *furl.*

Fash. An irregular seam. A mold-mark on projectiles.

Fashion-piece. In wood construction, it is the aftermost frame timber, and is secured to the ends of the transoms.

Faskidar. The Arctic gull (*Cataractes parasiticus*).

Fast. A rope or chain confining the ship to a wharf. It is called according to its position a *bow-fast*, *head-fast*, *breast-fast*, *quarter-fast*, or *stern-fast.*

Fast Aground. So completely aground as to be immovable.

Fast-stayer. A ship which goes about or tacks quickly.

Father (*Eng.*). Dock-yard name for the builder of a naval vessel.

Father-lasher. A certain salt-water fish (*Cottus bubalis*), allied to the river bull-head. Its head is large, and its spines formidable. It is found on the coasts of Britain, Newfoundland, and Greenland. In the latter country it is extensively used for food.

Fathom. A measure of 6 feet, roughly made by extending both arms; used in measuring cordage, depths, etc. *To fathom*, to find the depth by sounding; to comprehend. The table shows the fathom of different countries:

Country.	Name.	Fathoms.	Feet.	Inches.	Metres.
England and America.	Fathom.	1	6	72	1.829
Russia. France. Holland.	Shashainh. Grande Brasse. Groote Vadem.	1	6	72	1.829
France. Holland.	Moyenne Brasse. Koopvaarders Vadem	.916	5.5	66	1.676
France. Holland.	Petit Brasse. Bussmans Vadem.	.833	5	60	1.523
Denmark & Norway.	Favn.	1.029	6 175	74	1.834
Portugal.	Braça.	1	6.004	72	1.829
France.	Brasse.	.925	5.541	66.6	1.086
Prussia.	Fadem.	.984	5.906	71	1.826
Spain.	Braza.	.916	5.492	66	1.786
Sweden.	Famn.	.974	5.843	70	1.824
India.	Bam.	1	6	72	1.829

FATHOM-WOOD. Refuse wood from ship-building,—sold by the fathom.

Fat-quarter. A broad and full quarter.

Faucon and **Fauconnet.** Old form for falcon and falconet.

Favor. To spare, or to be careful of. The spars are favored by being relieved of undue strain. A ship is favored when she is eased or allowed to go off during squalls.

Fay-fena. A Japanese galley of 30 oars.

Feam. A small lighter's windlass.

Fearnaught or **Dreadnaught.** Woolen cloth of great thickness.

Feather. In mechanism, a prism or bar of metal, usually steel, one side of which is firmly embedded lengthwise in the surface of a shaft, either in a cylindrical or conical portion thereof, the projecting portion being fitted to a slot in the hub of a wheel, pulley, coupling, etc., for the purpose of constraining such hub to the rotary motion of the shaft, and at the same time permit it to slide or be easily removed in direction of its axis. A feather is sometimes embedded in the surface of the bore of a hub and fitted to a slot in the shaft. It differs from a key in the fact that it is immovable. *To cut a feather*. See CUT.

Feather an Oar. To bring the blades in a horizontal position so as to cut the wind as soon as they are out of the water. It is done by dropping the wrist at the proper time.

Feathering Float. A paddle or float of a paddle-wheel, so arranged as to turn on an axis and present its broadside to the water at its lowest submersion, and to turn its edge to the water in entering and emerging.

Feathering Paddle-wheel. A wheel whose floats have a motion on an axis, so as to descend nearly vertically to the surface of the water, and ascend nearly the same way, avoiding beating the water in the descent, and lifting it in the ascent. The loss of power from these causes is due only to the quantity of water thrown off as spray, or carried around the wheel; and, so far as this action is concerned, a feathering-wheel is equivalent to a radial-wheel having twice its diameter. No economy is accomplished by avoiding "oblique action" in solid water. There are numerous devices for feathering-wheels. See PADDLE-WHEEL.

Feathering Propeller. A term applied to any propelling apparatus in which the blades or floats turn upon an axis so as to present their edges to the water in dipping or entering, leaving or returning, and their broadsides when the propelling force is most effective. The term is suggested by the action of the feathers of the wings of a bird, and is applicable to oars, paddle-wheels, or submerged wheels.

Feathering Screw. A screw-propeller in which the blades can be set in a fore-and-aft direction, so as to present a minimum resistance to a vessel's headway when under sail alone. The term also applies to screws in which the blades can be turned and reversed on their axes by the steering apparatus, thereby dispensing with a rudder.

Feaze. To untwist a rope's end; to pull it to pieces.

FEAZINGS. The unlaid or ragged end of a rope.

Febiger, John C., Commodore U.S.N. Born in Pennsylvania. Appointed from Ohio, September 14, 1838; attached to frigate "Macedonian," West India Squadron, 1838–40; sloop "Concord," Brazil Squadron, 1841–43; wrecked in "Concord" on east coast of Africa, 1843; attached to brig "Chippola," purchased by government at Rio de Janeiro, and used to recover and dispose of equipment of "Concord," 1843–44.

Promoted to passed midshipman, May 20, 1844; frigate "Potomac," Home Squadron, 1844–45; sloop "Dale," Pacific Squadron, 1846–47; frigate "Columbus," Pacific Squadron, 1848; sloop "Dale," African Squadron, 1850; coast survey, 1852–57.

Commissioned as lieutenant, April 30, 1853; sloop "Germantown," East India Squadron, 1858–60; sloop "Savannah," 1861.

Commissioned as commander, August 11, 1862; commanding the steamer "Kanawha," West Gulf Blockading Squadron, 1862–63 engagement off Mobile Bay, April 3, 1862; commanding steamers "Osage," "Neosho," and "Lafayette," Mississippi Squadron, 1863; commanding steamer "Mattabeset," North Atlantic Blockading Squadron, 1864–65; engagement with rebel ram "Albemarle," in Albemarle Sound, May, 1864; commanding steamer "Ashuelot," Asiatic Squadron, 1866–68.

Commissioned as captain, May 6, 1868; commanding steam-sloop "Shenandoah," Asiatic Squadron, 1868–69. While commanding the "Shenandoah," entered and surveyed Ping-Yang Inlet, west coast of Corea. Inspector of Naval Reserved Lands, from 1869–72. Commanding U. S. steamer "Omaha," South Pacific Squadron, 1872–74. Member Board of Examiners, 1874–76. Commandant navy-yard, Washington, D. C., 1876 to August, 1880.

Feckless. Weak and silly.

Feed. Material for replacing that consumed, wasted, or transformed, in animal or mechanical economy, as the feed-water of a steam-boiler which replaces the water evaporated, or food for animals. *To feed*, to supply a steam-boiler with water, or a furnace with fuel, etc.

FEEDER. A stream that supplies a body of running water. A passing cloud bringing more wind in a gale.

FEEDER FORCE-PUMP. See FEED-PUMP.

FEEDING-GALE. A constantly increasing gale, worse after every squall.

FEEDING PART OF A TACKLE. The running part.

FEED OF GRASS. A supply of vegetables.

FEED-PIPE. A pipe, connected with a feed-pump or other apparatus, through which water is supplied to a steam-boiler.

FEED-PUMP. A force-pump for supplying steam-boilers with water to replace that which is evaporated, blown off, or lost by leakage. It is generally worked by some moving part of the main engine. It consists essentially of a cylinder in which a piston or a plunger is fitted, and may be made either single- or double-acting; receiving- and discharge-valves, which in large pumps are usually made of india-rubber; valve-chests or chambers; an air-vessel or chamber; and a "feed safety-valve," which permits the water to escape to the hot-well or reservoir, when communication with the boiler is checked. When a feed-pump is driven by a small special steam-cylinder, and independent of the main engine, it is called an "auxiliary," or "donkey"-pump.

FEED-WATER. The water reserved from the condenser of a steam-engine for the purpose of supplying the boiler. The term is generally applied to water passing into a boiler from whatever source.

FEED-WATER PUMP. A pump for supplying feed-water to a reservoir, whence it can be readily drawn by a feed-pump or injector.

Feel the Helm. A ship *feels her helm* when she obeys it.

Feint. A pretended attack.

Fell-head. The top of a mountain not ending in a peak.

Felt. Fabric made of wool, or wool and fur, or hair, compacted by rolling and pressure, with glue and size. It is used as a non-conductor on steam-pipes, boilers, cylinders, etc.

Patent felt, mixed with tar, was formerly put between the sheathing and the ship's bottom.

Felucca. A small vessel of Arabic origin, with lateen-sails; the helm may be used at either end.

Female-hemp. See FIMBLE-HEMP.

Female-screw. A cylinder with a spiral inside, into which a screw works.

Fencing. The art of using a foil, or sword, in simulated or actual attack and defense. The changes which modern science has brought about in the mode of conducting combats both on sea and land have very much lessened the chance of personal encounters between combatants, and have, as a consequence, relegated the art of fencing to a far lower degree of prominence than it formerly had. The officer, however, still wears a sword, and occasions demanding a right knowledge of its use as a weapon of offense and defense, though not of frequent occurrence, are yet among the chances of active service; the art of fencing, therefore, should still be cultivated, both as a factor in an officer's efficiency, and as a useful and graceful accomplishment.

Fend. To keep off. *To fend off*, to shove off, to keep from contact. *Fend the boat*, to keep it from touching the ship or wharf.

FENDER. Wood, rope, or other material used to prevent chafe. *Mat-fenders* are made of rope mats. *Grommet-fenders* are rope-grommets grafted or covered over with rope yarns. *Canvas-fenders* are bags of canvas stuffed with oakum or hair. *Cork-fenders* are nets of small rope filled with cork-shavings. *Rope-fenders* are made of short pieces of rope, plaited together. A *pile-fender* is a loose pile, planted in front of a wharf, to absorb the shock of a boat.

FENDER-BAR. A bar passing along the ship's side, to absorb the chafe, just above the water-line.

FENDER-BOLT. An eye-bolt, through which the fender-bar passes.

FENDER-PILE. One of any number of large piles, the upper part of which projects a suitable distance above the surface of the water, driven at the corners and ends of wharves, piers, or ferry-slips, which, by their resilience, prevent destructive shocks to vessels coming alongside in a strong current, wind, or tide-way.

Fernan-bag. A small ditty-bag to hold tobacco. A monkey's cheek-pouches.

Fernandina. A port of entry and capital of Nassau Co., Fla., on Amelia Island, 28 miles N.N.E. of Jacksonville. It has a good harbor, and is the N.E. terminus of the Atlantic, Gulf and West India Transit Railroad. Steamboats run three times a week from here to Charleston and Savannah. Pop. 3150.

Ferrara. An old broadsword named after Andrea Ferrara, the famous Spanish sword-maker.

Ferrol. A seaport town and one of the principal naval arsenals of Spain, in the province of, and 12 miles N.E. of Corunna, on the north arm of the Bay of Betanzos. Lat. 43° 29′ 30″ N.; lon. 8° 13′ W. Its harbor, one of the best in Europe, is entered by a narrow strait, and is defended by the castles of San Felipe and Palma. The town on its north shore is strongly fortified on the land side. Its vast arsenal and dock-yard covers nearly 24 acres, and comprises many magnificent docks and store-houses. It has a general and military hospital, naval barracks, and schools of navigation and mathematics. Pop. 21,500.

Ferrule. An iron band on the mizzen topsail-yard. A bushing to expand boiler-tubes.

Ferry. A place where goods or passengers are conveyed over narrow waters. The boat used in conveying goods or passengers over a stream; it may be propelled by hand, or by horse- or steam-power.

FERRY-BOAT. A boat for transporting goods or passengers over narrow waters. See FERRY.

Fetch. To reach; to arrive at; as, to fetch to windward of a point. *To fetch away*, to break loose. *To fetch headway*, to gather headway. *To fetch the pumps*, to cause the pumps to draw by pouring in water from the top to expel the air. *Fetch* is also the extent of a bay or gulf from point to point.

Fettle. To put in order; to repair. *In fine fettle*, in good trim; in high spirits.

Feu de Joie (*Fr.*). A salute of musketry by files.

Fez. A red cloth skull-cap worn by Mohammedans, and frequently by sailors in the Mediterranean.

Fid. A square, wedge-shaped bar of wood or

iron, placed in a mortise in the heel of a topmast or topgallant-mast. The ends, resting on the trestle-trees, take the weight of the mast and sustain it in place. Iron fids are generally used, with a laniard attached to prevent them from falling from aloft. Screw fids have also been designed, so as to be taken out without lifting the mast. A conical pointed piece of lignum-vitæ, or other hard wood, used to open the strands of a rope in splicing or working it. An iron fid is properly a *marlin-spike*. These fids are called *hand-fids*, and are from 14 to 20 inches long. Larger conical pieces of wood, of various sizes from 30 to 40 inches long, used to open the eyes of rigging, are called *setting-fids* and *standing-fids*. A vent-plug of oakum. A quid of tobacco. *To fid* a mast is to sway it up to its place and insert the fid.

FID-HAMMER. A hammer having one end of the head pointed, so as to serve as a fid.

FID-HOLE. The mortise in the heel of a mast, into which a fid is inserted; they are in length half the diameter of the mast, and their width is two-thirds of their length.

Fiddle. A rack, used on a table, to keep the crockery on, formed of frames connected by tape or cord.

Fiddle-block. A block having two sheaves lying in the same plane, one above the other. They are used for burtons, yard-tackles, etc.; called also *long-tackle-block*.

Fiddle-fish. The king-crab (*Limulus polyphemus*).

Fiddle-head. The scroll on a ship's bow, that turns inwards, like the head of a fiddle.

Fiddler. A small crab with one claw longer than the other.

Fiddler's Green. A sailor's paradise, where dance-houses and kindred amusements abound.

Field-artillery. Light artillery for use on shore, in distinction from boat-artillery. See HOWITZER.

Field-carriage. The carriage for a light piece of ordnance, by which it is transported when on shore. See HOWITZER.

Field-day. A day of drills or exercises. A day for general cleaning or overhauling.

Field-gun. See FIELD-PIECE.

Field-howitzer. A howitzer mounted on a field-carriage for use ashore.

Field-ice. A large extent of floating ice, adrift or stationary. Detached pieces are *floes*, and when they suddenly reunite, cause *nips*.

Field of View. The circular space visible through a telescope.

Field-piece. A piece of ordnance for use on land, so mounted as to be capable of transportation.

Fiery-flaw. See FIRE-FLAIRE.

Fifer. The marine who plays the fife.

Fife-rail. A rail about the mast, supplied with pins to belay ropes to, and with blocks to lead them through.

Fig. In *full fig*, in full dress.

Figala. An East Indian vessel with one mast, and propelled by paddles.

Figger. A Smyrna trading-vessel.

Figgie-dowdie. Plum-duff.

Fight. An engagement or battle.

FIGHTING-LANTERN (*Eng.*). See BATTLE-LANTERN.

FIGHTING-CANVAS, or FIGHTING-SAILS. Sails used in action. Formerly, topsails and courses. In future, sails will be furled.

FIGHTING-STOPPER. An arrangement of two dead-eyes, connected by rope laniards, and furnished each with a tail of rope. When a shroud is parted in action, the tails embrace the severed parts, and then they are hauled together by the laniard. See STOPPER.

FIGHTING-TRIM. In proper trim to commence an action.

FIGHTING-WATER. Casks or tubs of water placed about the deck for use during action, or in cans in the magazine. Vinegar is added to it in some services.

FIGHTS. An old word for screens to conceal the men from the enemy. See CLOSE-FIGHTS.

Figure. The ornament at a ship's prow, whether a *scroll*, *fiddle-head*, *billet*, or *figure-head*.

FIGURE-HEAD. An image or carved figure formerly carried at the prow. The Phœnicians carried the figures of the marine-protecting deities, adopted from them by the Greeks under the name of Dioscuri, or Castor and Pollux. Ancient Egyptian ships carried a ram's head or a carved lotus. Roman ships carried the head of a lion, ram, dragon, etc. Early Norman ships commonly carried a dragon's head or serpent's head, and sometimes an archer. Full-length figures of Neptune, of Mercury, and other Greek gods were common in 1600–1700, and the statues in carved wood of great men, of allegorical subjects, as Hope, etc., were then used. Busts or half-length statues were more common. Many of these carvings were works of art. The adoption of ramming, and first the straight, then the ram-bow, caused them to fall into disuse, and they are seldom seen on iron or armored vessels.

Figure-of-eight. A knot made in the shape of the figure 8.

Fike. See FYKE.

Filadière. A small flat-bottomed boat of the Garonne.

File. In mechanical art, an implement of hardened steel, having its surface cut into sharp furrows or teeth, used principally for shaping or smoothing metals, but frequently used on other substances. There is a great variety of shapes, sizes, and degree of fineness of teeth or cut. The cross-section may be rectangular, square, round, half-round, triangular, or wedge-shaped (knife-edged); the longitudinal section usually tapers or curves from the "shank end," which receives the handle, to the point. The sizes of files are denoted by their length in inches, and the principal degrees of fineness by the terms "bastard," "second cut," "smooth," and "dead smooth." Small round files are called "rat-tail" files; files having parallel teeth cut in one direction only, that is, not crossed at a right angle by other teeth or furrows, are called "float-cut" files; and flat files having one or both their edges left blank, or without teeth, are called "safe-edge" files. *An old file*, a nickname for a cunning, humorous character.

FILE-FISH. One of a class of fishes having their skin granulated like a file. They are intermediate between the bony and cartilaginous fishes, and constitute the genus *Balistes*.

Filibuster. A freebooter. A name first applied to the adventurer Lopez in 1849.

Fill. *To fill the sails*, to trim the yards so that the wind shall blow on the after-part of the

sails. *To fill a yard*, to fill its sail. *To fill away*, to fill a sail or sails that have been aback. *To fill a ship's bottom*, to cover her bottom with broad-headed nails so as to give her a sheathing of iron. Copper sheathing is now preferred. *To fill in*, to put in timbers wherever solidity is required; as, between the frames in a ship.

FILL AND STAND ON. To fill the sails and resume the course after heaving to.

FILLER. A strip of wood inserted in a made mast to fill up a deficiency.

FILLING-ROOM. A small room formerly partitioned off from the magazine for a filling-place for shell, etc.

Fillet. The ornamental rings formerly cast about the muzzle or cascabel of a gun. The rounded surface joining the plane surfaces of a gun.

Filter. An apparatus for purifying water. Sailors call a stone filter a *drip-stone.*

Fimble Hemp, or Female Hemp. The hemp which produces no seed, and is chiefly used for domestic purposes. *Carl*, or *male* hemp is used for cordage.

Fin. An organ of a fish, consisting of a membrane supported by rays, or little bony or cartilaginous ossicles, and serving to balance and propel it in the water. Fishes move through the water chiefly by means of the tail, the principal office of the fins being to balance or direct the body, though they are also, to a certain extent, employed in producing motion. Jocular for *hand; tip us your fin*, shake hands.

FIN-BACK. A whale of the genus *Balænoptera*, having a tough fin on its back. Some are 80 to 90 feet long. It has little oil, no whalebone, and is hard to catch. Also called *finner* and *finwhale.*

Find. To provide; to furnish.

Finding. The verdict of a court-martial.

Findon Haddock. A kind of Scotch haddock.

Fine. *To fine* the under-water body is to prolong and sharpen the ends. A *fine* entrance is a sharp under-water part of the fore-body of the ship.

Finger-shell. A marine shell resembling a finger.

Finner. See FIN-BACK.

Finnie. Scotch salmon less than a year old.

Finnock. A kind of Scotch salmon.

Fintrum Speldin. Small dried haddock.

Fiord. A deep narrow inlet of the sea on the Norwegian coast.

Fir. Fir is the wood of a tree of the genus *Abies.* The Scotch fir is a pine. For the frames of men-of-war its use has been rare, but 17 English men-of-war were built of it from 1750 to 1806 Their average life was 9 years. Fir is used for ship's spars, and for plank of the bottom. The best fir comes from Riga and Dantzic. The early frigates of our navy were made of fir, and lasted fairly well.

Firbome. An old term for a beacon.

Fire. The effect of combustion; a conflagration. To kindle; to set on fire. To discharge a fire-arm; the discharge of fire-arms.

A raking fire is delivered from ahead or astern of a vessel, the projectiles passing through in the direction of her length. In early days one of the great points in a sea-fight was to rake the opposing ship without being raked by her. Since the introduction of ironclads it is not a matter of so much importance.

To fire at will is to fire the guns independently of each other, each gun-captain seizing the most favorable opportunity; this firing is used in action when the object is visible.

To fire in succession is to fire one gun after another in regular order, beginning with the forward gun if the wind be aft, or with the after gun if the wind be from forward; this firing may be used at the beginning of an action, or when a steady continuous fire is desired.

Quick firing is rapid firing at will, the tangent sight not being raised; this firing is used when close alongside an enemy, when but little pointing is required.

When a gun is so laid that the projectile strikes the object without grazing between the gun and object, the fire is *direct;* this firing is used at short range or at great ranges, when great penetration is desired, or when the surface between the gun and the object is so rough that the force and direction of the projectile would be injuriously affected. When the gun is so laid that the projectile makes one or more grazes before reaching the object, the firing is denominated *ricochet;* that properly so called is performed with the gun laid level, or at most at 3° elevation; though shot will often ricochet at greater angles of elevation.

Practically, ricochet fire is of no value from rifled guns firing elongated projectiles. In experimental practice over perfectly smooth water, it will often be observed that successive projectiles of high velocity and rapid spin maintain a certain uniformity of flight on the first one or two bounds; but the *slightest* irregularity of the reflecting surface causes them to lose all certainty of direction. The flatness of the trajectory of the rifle, by greatly increasing the dangerous space, has correspondingly decreased the importance of ricochet fire. For smoothbores, however, ricochet firing upon a smooth surface, within certain distances, has some important advantages over direct firing. When the guns have very little or no elevation, and are near the water, as they are in a ship's battery, the projectile strikes the water at a very small angle; its flight is not greatly retarded by the graze, and it rises but little above the surface in its course. The distant charge should always be used, but the penetration is not to be depended on beyond 1500 yards against unarmored ships of war. At low elevations it requires only correct lateral direction, since the projectile would rarely pass over and would probably strike a vessel if within its effective range, whether the actual distance had been correctly ascertained or not. The deviation of the projectile is, however, generally increased by ricochet and in proportion to the roughness of the surface of the water. Even a slight ripple will make a perceptible difference not only in direction, but in range, penetration, and the height to which the projectile will rise in its bounds.

Although these facts demand attention, yet when the estimated distance does not require an elevation of more than 3°, projectiles from guns pointed rather too low for direct firing will probably ricochet and strike the object with effect, even when the water is considerably rough. This may be called *accidental ricochet.* When

the water is not smooth, the most favorable circumstances for such firing are when the flight of the shot is with the roll of the sea and that roll is long and regular. Ricochet will be effective against small objects up to 2000 yards, but should not commence at less than 600 yards. Shot rarely ricochet at all with elevations above 5°, and the bounds are always higher, with equal charges from the same gun, as the elevation of the gun is increased.

A fire is said to be *curved* when the projectile clears an intervening object and descends upon the target. A fire is said to be *plunging* when the target is below the level of the gun: it is particularly effective against vessels.

Horizontal fire includes all kinds where the velocity of the projectile is due to the charge. *Vertical* fire includes all kinds where the velocity of the projectile on impact is mainly due to the attraction of gravity. See MORTAR.

Concentration of fire may be desirable under certain circumstances; and arrangements have been sometimes made to secure it by the simultaneous discharge of a number of guns upon some part of an object whose distance is known. The advantages of these arrangements are not very obvious, excepting in cases where the position of the enemy may be visible from one part of a ship and not from all the guns in the battery. The object sought to be obtained is therefore to aim from inboard at an invisible target, the distance and direction of which are indicated by the commanding officer. It is consequently necessary that he shall be so placed as to obtain a distinct view of the enemy, or have suitable observers to inform him of his exact position.

FIRE-ALARM. A signal to denote that a fire has broken out, and to summon the officers and men to their stations for suppressing it. See FIRE-BILL.

FIRE-AND-LIGHTS. A nickname for the master-at-arms.

FIRE-ARM. A weapon acting by the force of gunpowder, discharging a ball. The Chinese claim to have used fire-arms in 304 B.C. A stone-thrower was used in China in 757 A.D. In 1200 the Mongols used fire-arms, and in 1258 Genghis Khan used them. They became of universal use during the 14th century. One of the first instances of their use afloat was by the Venetians against the Genoese, in 1377. Other explosive materials have been tried in them with but little success.

FIRE-ARROWS. Arrows wrapped with tow soaked in turpentine, used frequently in the naval actions of the 17th century. The last instance of their use afloat in a large action was that of the French in the East Indies in 1758.

FIRE AWAY! Go on with your remarks.

FIRE-BALLS. Balls made of tow and tallow, mixed with sulphur and pitch.

FIRE-BARRELS. Small stout barrels filled with inflammable composition, used in fire-ships, to increase the combustion.

FIRE-BAVINS. Short bundles of brush-wood dipped in inflammable composition, and fastened about parts of a fire-ship to spread the flame.

FIRE-BELL. The quick ringing of the ship's bell, the signal for a fire.

FIRE-BILL. The bill giving the stations of the crew on an alarm of fire. They are distributed in proper places to work the pumps, lead out hose, act as axmen, or smotherers, assist in hauling up sails, in hoisting provisions, in getting out the boats, drawing the charges of the guns, etc. See EMERGENCIES AT SEA.

FIRE-BOOM. A boom swung out from the ship's side to keep off fire-ships. See FIRE-SHIPS AND RAFTS.

FIRE-BRICK. An infusible kind of brick used for lining the inside of furnaces or flues not exposed to water, when necessary to protect them from intense heat.

FIRE-BRIDGE, or BRIDGE-WALL. A wall which forms the back end of a furnace, and over which the heated gaseous products of combustion pass. It may be built of fire-bricks, or it may be an iron shell filled with water and forming part of the boiler. Fire-bridges are also built at intervals in the large masonry flue under long cylindrical boilers, for the purpose of mixing the gases and bringing them in close contact with the surface of the boiler.

FIRE-BUCKET. A bucket of canvas, leather, rubber, wood, or metal, used in case of fire. Those used in the navy are made of light tanned sole-leather, and a laniard, several fathoms long, is attached to each, to be used in drawing water from aloft.

FIRE-CLAY. Clay (a silicate of alumina) from which fire-bricks are made and in which they are laid or cemented.

FIRE-CREW. The crew of a fire-ship that conduct her into action, and after inflaming her leave her to her fate.

FIRE-CURTAINS. Curtains of canvas dipped in inflammable mixtures, and suspended from the beams of a fire-ship, to increase the combustion.

FIRE-DRAKE. A meteor. The *corpo santo* of old navigators.

FIRE-EATER. A hotspur. A man fond of fights and fighting.

FIRE-EXTINGUISHER. A small portable apparatus for extinguishing an accidental fire in its incipiency. Its action is to throw upon a fire a small stream of water surcharged with carbonic gas. It consists essentially of a very strong metallic case or vessel, which is filled with water, together with a suitable quantity of carbonate of soda or lime, and which contains a small receptacle, made of lead, glass, or other suitable material, for holding a quantity of sulphuric acid sufficient to combine with the carbonates and form sulphates, while releasing carbonic acid gas, which the water holds in suspension, and which, by its pressure, gives force to the stream. The acid and carbonates are securely isolated from each other until the apparatus is required for use. There are many devices for effecting the combination or mixture, one being designed as early as 1816. The fire-extinguishers furnished the navy are now of the Babcock pattern, in which carbonic acid is generated, and cast on the fire.

FIRE-FLAIRE. The sting-ray (*Raia pastinaca*).

FIRE-FLAUGHTS. The northern lights.

FIRE-HEARTH. The hearth about the galley.

FIRE-HOOPS. Hoops wrapped in tow and soaked in inflammables. Used by the Knights of Malta in the middle ages.

FIRE-LOCK. A gun-lock inflaming the powder by striking a flint. A gun having a flint-lock.

FIREMAN, or STOKER. A man who manages fires. On board vessels of war firemen are di-

vided into two classes, viz., first- and second-class firemen. A first-class fireman is required to be thoroughly skilled in making, maintaining, and cleaning fires with all the varieties of coal in general use, and in all the preparations for starting fires and raising steam in boilers. He must be acquainted with the methods of keeping the water in boilers at the proper height and density; be familiar with the various cocks and valves in common use in marine machinery; capable of packing stuffing-boxes, making steam-joints, "laying up" and preparing packing, cleaning bright-work, and starting or stopping and lubricating either the main or auxiliary engines or pumps. Skill in the use of mechanics' tools adds to his efficiency.

A second-class fireman must be skilled in the management of fires, boilers, and pumps, and have a good general knowledge of the duties of a first-class fireman.

A fireman is, also, one whose duty it is to extinguish fire.

Fire-quarters. The assembly of the crew on an alarm of fire. The fire-bill gives each his station, and this is to be taken instantly on an alarm. Pumps are rigged and manned, ports closed, charges drawn from the guns, hatches covered, sails trimmed, and preparations made for getting out the boats, if at sea, or they are lowered in port. Friday is the day usually set apart for the purpose of drilling in this.

Fire-raft. A raft of floating timber, arranged with combustibles, and set afloat against an enemy's fleet. See Fire-ships and Rafts.

Fire-room, or Stoke-hole. A room or space at the fronts of steam-boilers devoted to the management of the fires, and, generally, to all operations connected with the management of boilers under steam, such as feeding, observing pressures and temperatures, height of water in boilers, degree of saturation of water in boiler, blowing, etc. When the fronts of boilers face amidships, it is a fore-and-aft fire-room, and when they face forward or aft, it is called an athwart-ship fire-room.

Fire-ships and Rafts, Explosion-vessels and Booms. Fire-ships are vessels loaded with combustibles, set on fire, and drifted or propelled against fleets, forts, or obstructions. Such inventions have been used for centuries, and have played an important part in many contests. The first account of the use of fire-ships is at the siege of Tyre, 333 B.C. The Tyrians here sent a galley, loaded with stones and prepared with sulphur, etc., against the mole built by Alexander, partially destroying it. Six other instances of the use of fire-ships before the Christian era are recorded. Fire-ships were used by the Rhodians in a contest with the Syrians, 191 B.C., and Livy alludes to their use by that maritime nation in 190. The Carthaginians, in 149 B.C., sent boats filled with combustibles against the Roman fleet under Manlius, attacked and partially destroyed it. In 38 B.C., two of the fleets of Augustus were destroyed by Cassius; the first, under Pomponius, by several ships filled with pitch, hemp, etc.; the second, under Sulpicius, by forty fire-ships, in the harbor of Vibo.

Two more instances of their use are given before the introduction of Greek fire. In 439 Genseric towed a number of fire-ships out of Carthage harbor against a Roman fleet under Basilicus, and destroyed most of it. Belisarius, in 545, destroyed a bridge thrown across the Tiber near Rome by Totila, by a fire-boat, carried in a tower erected on two galleys, by means of which the boat was dropped on the bridge.

In 673, an Egyptian, Callinicus, in the Greek service, invented Greek fire, and the use of this combustible liquid seems to have given a new impulse to the employment of fire-ships. This liquid, long known under its various names of "Ignis Græcus," "Greek fire," "Wild fire," and "Maritime fire," was the forerunner of powder, consuming all within its reach, and only being quenched by sand, vinegar, and acids. It was poured from sides of ships, from battlements and turrets, shot in balls and arrows, and ejected from horrid-mouthed brazen tubes. The Greeks long preserved the secret, but the Saracens finally obtained it, and its disuse only came with the advent of powder. Sometimes, as at Constantinople in 717, old vessels were impregnated with this liquid, and thus made more formidable, set adrift against the enemy. There, also, in 951, 953, the Russian fleets felt their force, two being nearly destroyed by the fire-galleys sent against them.

During the Crusades we meet with Greek fire continually, and also with fire-ships. Notable are those used at Zara in 1171 against the Venetians, two unsuccessful attacks, one with 17 fire-ships, by the besieged Greeks against the Venetians at Constantinople in 1204, and the fire-ships used by the Pisans at Geneva in 1218. The fire-ships used at Reggio by the Saracens are called "Jeremitas" by old chroniclers.

In 1370, the English first used them at Zuruckzee, and they were visited by them at Rochelle in 1372.

They were first used in a sea-engagement by the Spaniards against the English in 1406. The Venetians at Syracuse in 1433, and the Knights at Rhodes in 1440, used these weapons.

The more important use of fire-ships, the inauguration of explosion-vessels, and the use of an elaborate boom for defense, occurred at the siege of Antwerp in 1585. Thirteen fire-ships were used, and set afloat against the boom with the explosion-vessels, but the latter only caused disaster The Great Armada was first disorganized and thrown into confusion by eight fire-ships sent against it by Lord Howard at Calais, July 27, 1588. Fear of these led the Spaniards to run out, and they were met and defeated on Goodwin Sands soon after.

During the 17th and 18th centuries the use of fire-ships became almost universal. Nearly every fleet had them, from one to twenty in number, and in the long and bloody wars between the English and the Dutch they were often used with disastrous results, the large fleets of cumbersome ships being particularly vulnerable to their attacks. They were then used in sea-actions. Three ships were destroyed by one in 1653, and four Dutch ships in 1665 by one, the loss of life being heavy. One hundred and ninety Dutch vessels were destroyed by fire-ships at Vreeling. Fire-ships were used in connection with explosion-vessels in the English attacks on St. Malo, Dieppe, and Dunkirk in 1693–94, and at Dunkirk a peculiar "smoke-ship" was used to disconcert the aim of the gunners, but it failed.

They were used on this continent at Quebec in 1759, and at Philadelphia in 1777. They were last used in sea-actions by Matthews in 1746, and by Boscawen in 1759. From this time they diminished in numbers, and we only hear of them as occasionally employed during the present century. Fire-ships were used at Basque Roads in 1809, again with explosion-vessels, but effected nothing. At Washington in 1814, Commodore Rodgers used them without effect, and the Turks had five in their fleet at the battle of Navarino. In 1822, the Greeks at Scio revenged themselves on the Turks by sending against their victorious fleet two fire-ships and several launches, June 7. Two ships were destroyed, and more than two thousand men killed.

In 1840–41, the Chinese sent fire-rafts and junks against the English on five occasions, but effected nothing. Fire-rafts were sent down the Mississippi, first in October, 1861, throwing the ships into confusion, again from April 16 to April 21, against Farragut's fleet, adding to the terrors of the night-assault of Forts Jackson and St. Philip, but effected little, and were easily avoided. One, however, was pushed by a ram, and set the "Hartford" on fire, but the flames were extinguished. The steamer "Abtao" was fitted as a fire-ship in 1879 by the Chilians, but was not used.

Fire-ships were generally old vessels of 50 to 150 tons. In a central compartment fire-barrels were placed, filled with powder, pitch, and tallow. Troughs led along the decks, in which reeds, dipped in rosin, pitch, tallow, and powder, were placed, bundles of brush aiding them, and fuzes led through scuttles to the barrels below, and to sally-ports. Small iron pieces blew the ports open, and barrels of composition on deck, boxes in tops, channels, from bowsprit, davits, etc., and fire-curtains from the beams, aided the conflagration. Fire-ships sailed to windward, fought to leeward, prepared for battle, and went into action, on signal. The duty was hazardous, and little quarter was given to captured crews. Steam-vessels will be more formidable as fire-ships, and may yet be used in defending harbors, but fire is not so terrible to iron-cased ships, with wire rigging.

Explosion-vessels have been used less often than fire-ships. The first was at Antwerp. They were invented by Giambelli, an Italian. Four were used, but one broke the boom and killed 800 people, blowing up six ships, and flooding the shores. They were strong flat boats, containing 7000 pounds of powder, in a brick well, roofed with heavy stones, and charged with missiles of all kinds. The French prepared a vessel in 1688, to use at Algiers, but did not use it. Explosion-vessels were sent against the ports of St. Malo, Dieppe, and Dunkirk on four occasions, in 1693–94, but all failed to damage the towns. The next use of explosion-ships was that of our forces at Tripoli, the ill-fated "Intrepid," in which all those engaged were killed. This was during the night of September 4, 1804. The ketch was sailed in, and parted company with her convoy of 3 vessels at the entrance of the harbor, and was last seen from them sailing in towards the mole. Suddenly she blew up, either having been fired by her crew or exploded by a shot from the forts.

During the same year a floating-mine was sent against Fort Rouge, at Calais, but effected no damage.

In 1809 several attempts were made against Rochefort with floating-mines, some of which were ships of large dimensions. The explosions shook the earth for miles around, but nothing was gained by them.

Finally, more formidable attempts were made against the French fleet at Basque Roads. Three explosion-vessels and 9 fire-ships were sent against the fleet and boom. The explosion-vessels were made by placing firmly-wedged logs in the hold, piling spirit-casks, containing 1500 barrels of powder, and bound round with hempen cables. Several hundred shells were placed on top, and some 3000 hand-grenades wedged with sand. These were sent under sail, and one was swept away by a fire-ship, but one exploded near the boom, breaking it by the force of the wave.

At Wagram, on the Danube, boats filled with 5 barrels of powder, arranged to be fired by the carrying away of the mast on collision with the bridge, were sent down the river, but effected nothing.

Lord Exmouth took an explosion-vessel to Algiers in 1816, but did not use it.

The last occasion on which an explosion-vessel was used was at Fort Fisher, December 24, 1864. An old steam-vessel was here used, and the powder was stowed rather loosely in bags about the lower decks, while fuzes, clock-work, and a fire were depended on to ignite the formidable charge. Towed in and anchored within 300 yards of the fort, the charge was fired in time, causing a severe shock, but no damage to the fort.

Booms are naturally connected with this subject, having been used principally to keep fire-ships out of harbors. We find records of such defenses as early as the siege of Syracuse, 413 B.C. Chains were used in the harbor of Constantinople as early as 700 B.C. In the middle ages such defenses became more common, and the further defense of sunken ships was inaugurated by the Rochellais in 1371. The first formidable defense was used at Bonifacio, in Corsica, in 1420, where a bridge of great plank was defended by 5 ships ranged in a line. This was surpassed by the great Antwerp structure, built by the Duke of Parma in 1585, a structure made partly of piles and partly of a floating-bridge of vessels, moored head and stern, and defended by anchored floating-batteries. As we have seen, this was broken by Giambelli's explosion-vessel, but it was repaired the same night, and served its purpose.

During the 17th and 18th centuries these defenses were much used, sometimes chains only being thrown across the harbor, at others ships were sunk, hulks with heavy batteries anchored near, etc.

The earliest formidable attempt to use a boom was at Basque Roads, in 1809. Heavy cables were here fastened to logs and anchored across the channel, while line-of-battle ships at either end defended the structure. This boom was broken by Cochrane's explosion-ships.

During the civil war in this country torpedoes planted in the stream added their force to the defense of a boom, and elaborate systems of booms were made. At Charleston extensive series of such were found. When Farragut's fleet at-

tacked New Orleans formidable chains stretched across the river, and buoyed up by hulks, were first encountered, and destroyed by slipping.

Sunken vessels were frequently employed, notably at Charleston, effectually closing the channels.

The latest use of booms was by the Paraguayans, in their war of 1864–68 with Brazil.

Booms will not answer alone to obstruct a harbor, but combined with torpedoes, batteries, and sunken obstructions, they will always be found useful for the purpose.—*F. S. Bassett, Lieutenant U.S.N.*

Fire-surface. The surface of a steam-boiler which is exposed to the fire or furnace heat.

Fire-tub. A tub, provided with a wire grating, placed at the foot of a canvas shute, by which empty powder-boxes are returned from the deck above.

Fire-works. The rockets, blue-lights, false fires, and chemical signals used on board ships. They are packed in light boxes, and placed under the eye of a sentry, away from the magazine.

Firing-key. That key of an electric machine or battery which, upon being pressed, closes the circuit, and fires the gun or torpedo connected with it.

Firing-lever, Firing-pin, Firing-bolt. The assemblage of levers, etc., by which the charge of a towing torpedo is fired.

Fires. In mechanics, the masses or beds of burning fuel in furnaces.

Fires, Bank. To collect fires into small heaps or "banks," covering them heavily with fresh coal, and leaving a large portion of the grates bare, so that the draft may not pass through the incandescent fuel; the object being to suppress combustion, and the consequent formation of steam when no longer required for immediate use, and, at the same time, to preserve a desired pressure and temperature of steam, and retain sufficient fire to readily ignite the fuel required for a full or "spread" fire. The best place to form a bank is near the mouth of the furnace, and a few inches clear of the dead-plate, and it should be as compact as possible.

Fires, Haul. To entirely withdraw the fires from the furnaces, either while they are burning briskly or nearly extinguished. This operation is performed whenever a boiler becomes useless or dangerous from excessive leakage or from overheating caused by scant water-supply, or when it is known that steam will not be required for a definite period of time, and it is desirable that the boiler be cooled, cleaned, or repaired expeditiously.

Fires, Spread. To open or spread banked fires over the whole surface of the grates, and, at the same time, to supply them with the requisite quantity of fuel for forming steam.

Fires, Start. In steam-enginery, to kindle new fires in the furnaces of a steam-boiler for the purpose of raising steam when the machinery has not been in use for a period of time. The principal preparations required are, that the man-hole, hand-hole, and other "joints" are properly made; that the boiler is filled with water to the proper level; that the mouth or front of the furnace is supplied with kindling-wood and other inflammable material; and that the grates, on parts not occupied by kindling-stuff, be thinly covered with coal so as to check the draft through them at the back ends of the furnaces and direct it upon the fire in front. In vessels of war these preparations are usually completed before the order to start fires is given.

Firing. The act of kindling or maintaining fires.

Firing Tools. Tools or implements for managing fires. They consist of large steel "scoop-shovels" for handling coal and ashes; "slice-bars," which are stout bars of round iron flattened and pointed at one end and formed into an eye-handle at the other, and having sufficient length to reach the back end of a furnace, leaving two or three feet to project outside,—used to pass under the fires close to the grates for the purpose of detaching clinkers or breaking up caking coal; "pickers," which are bars or rods having the same length as slice-bars, though of lighter material, and having the fire end bent at right angles and flattened so as to pass between the grate bars from underneath,—used for removing ashes and stirring fires without opening furnace doors; "devil-claws," bars or rods having three bent prongs at their ends,—used for withdrawing clinkers from a fire; and "hoes," the fire ends of which are provided with flat "blades" or plates of iron fixed at right angles to the bar,—used in banking or hauling fires. The above-mentioned tools, except shovels, are sometimes called "fire-irons," and, like the slice-bar, are provided with handles, and have sufficient length to reach the back of a furnace and project a proper distance outside, so that the fireman may not be compelled to approach the fires too closely.

First Lieutenant. The executive-officer (which see). An officer of marines ranking with a master in the navy.

First Mate, or First Officer. The officer of a merchant ship next in rank to the master.

First, or Prime Meridian. See Meridian.

First Point of Aries. The vernal equinoctial point. See Aries.

First Point of Cancer. The summer solstitial point. See Cancer.

First Point of Capricorn. The winter solstitial point. See Capricorn.

First Point of Libra. The autumnal equinoctial point. See Libra.

First-rate. A ship of the first-rate is one of the highest grade. In our navy it comprises all steamers of 4000 tons or more, and ironclad steamers of 3000 tons or more.

First Watch. The watch, or period of time from 8 to 12 P.M. The portion of the crew on duty at that time.

Firth. See Frith.

Fish. To angle for fish; hence, to take anything out of the water. To hoist the fluke of the anchor up to the bill-board. To secure a spar with a fish. To search for a star. A vertebrate animal breathing through gills and living in the water; the name is also applied to mammals, as whales, etc. Fish are divided by naturalists into six families, most of which are marine. A purchase used to raise the fluke of the anchor up to the bill-board. A piece of wood or iron used to strengthen a damaged spar. Fish is used as an epithet; as, *queer fish*, *odd fish*, etc. *Fresh fish*, greenhorns. *As mute as a fish*, *as dry as a fish*, expressions used to denote perfect silence, extreme thirst. *Fish! Fish!* The cry of a whaler when a whale is sighted.

FISH-BACK. A line from the back of the fish-hook, to assist in hooking it to the arm of the anchor.

FISH-BOOM. A boom or spar by the aid of which the anchor is fished. It usually has one end connected to an eye on the foremast by a goose-neck, and the tackle connected to the other end, a double block hooking to it, and the fall leading up through a sheave in the boom, a block on the foremast, and then on deck. Sometimes a pennant is used, leading through the sheave on the boom. A topping-lift elevates the boom, and it is moved by small guys on either side. When not in use the boom is lowered into an iron crutch on the forecastle.

FISH-DAVIT. See DAVITS.

FISHER-FISH. A species of *Remora*, said to be trained by the Chinese to catch turtle. When a turtle is perceived basking on the surface of the sea, the men, avoiding all noise, slip one of their remoras overboard, tied to a long and fine cord. As soon as the fish perceives the floating reptile he swims towards it, and fixes himself on it so firmly that the fishermen easily pull in both together.

FISHERMAN'S BEND. A knot, for simplicity called the king of all knots. Its main use is for bending studding-halliards to the yard, by taking two turns round the yard, passing the end between them and the yard, and half hitching it round the standing part.

FISHERMAN'S WALK. The short walk afforded by the deck of a fishing-boat, "three steps and overboard."

FISH-FAG. A fish-woman. A female fish-porter.

FISH-FALL. The rope forming the purchase known as the fish.

FISH-FLAKE. A stage on which fish are dried.

FISH-FRONT. A strengthening slab on the front of a made mast.

FISH-GARTH. A fish-weir on a river-bank.

FISH-GIG. A spear with several barbed prongs for spearing fish.

FISH-HACK. The fish *Gobius niger*.

FISH-HOOK. A hook used in angling. A large iron hook attached to the fish-pendant, or to the lower block of the fish-purchase, used to hook the arm of the anchor so as to fish it.

FISHING-BOAT. A small boat used for fishing.

FISHING-FROG. The devil-fish or angler (*Lophius piscatorius*).

FISHING-GROUND. A bank or shore frequented by fishermen.

FISHING-SMACK. A fishing-vessel having a well in the hold to preserve fish alive.

FISHING-TACKLE. Lines, hooks, rods, nets, etc., for catching fish.

FISHING-VESSELS. All vessels employed in fishing.

FISH-PENDANT. A large rope attached to the lower block of the fish-purchase and leading through a sheave in the fish-boom, having the fish-hook at its lower end.

FISH-PURCHASE. See FISH-TACKLE.

FISH-ROOM. A room in old men-of-war, between the after hold and the spirit-room, where fish, and sometimes spirits, were kept.

FISH-SPEAR. A short spear used in fishing.

FISH-TACKLE. The assemblage of rope, blocks, and hook by which the anchor is fished.

FISH-TAIL PROPELLER. A propeller consisting of a blade hung on pivots, the axes of which are not coincident with the centre of pressure of the blade, attached to the end of a lever oscillating in a plane parallel to the direction of the vessel. The automatic oscillatory motion of the blade itself is constrained to a desired angle by stops, and it is so arranged that its action can be reversed. The device has never met with practical success.

FISH-TORPEDO. A self-impelling torpedo. See TORPEDOES.

FISH-WIFE, or FISH-WOMAN. A woman who deals in fish. A female fish-seller.

Fist. To lay hold of; to seize. *Hand over fist*, rapidly.

Fistularia. A genus of acanthopterygious fishes characterized by having the head prolonged into a slender tube, with the mouth at the extremity,—named by Linnæus.

Fit. To adapt to any purpose. *To fit the rigging*, to worm, parcel, and serve it, turn in dead-eyes,—in short, to prepare it for use at sea. *To fit out*, to supply with necessaries.

FIT-ROD. A small iron rod with a hook at one end, used to sound the holes for bolts in a ship's side.

FITTED FURNITURE. Spare articles, such as bucklers, chocks, port-lids, etc., furnished to a ship.

Fiume. A seaport town of Austro-Hungary, and the only important seaport for the outlet of the produce of Hungary, situated on the small river Fiumara, where it falls into the Gulf of Quarnero, at the N.E. extremity of the Adriatic. Lat. 45° 19′ 36″ N.; lon. 14° 26′ 45″ E. The harbor is indifferent, and admits only small vessels, but the roadstead has depth of water for vessels of any size and is well sheltered. Pop. 13,500.

Five-fingers. A name of the star-fish (*Asterias*).

Five-share-men. Men who enlist on shares of one-fifth in whalers.

Fixed-ammunition. See AMMUNITION.

Fixed-blocks. An old name for the chess-trees.

Fixed Stars. See STARS.

Flabbergast. To astonish by extraordinary statements.

Flag. The national colors or standard. Anciently a standard consisted of an object fixed to the end of a pole and borne like the modern flag, but, unlike it, not intended to wave or flutter with the wind. The Egyptians used an animal, the earlier Greeks a piece of armor, Romulus a bundle of hay, his descendants a hand, and the later Romans the eagle. The Crusades made the cross a favorite standard with the nations of Europe. Napoleon adopted the eagle of the Romans, and Austria and Russia the double-headed eagle, which had originated with the emperors of the East to symbolize their claim to rule both the eastern and western empires.

The national flag of the United States assumed the form which it now has after many experiments and as the result of much thought and discussion. The flags used by the colonies before their separation from the mother-country would naturally be those of England. This, however, does not appear to have been strictly the case,—several flags, differing more or less from those of that kingdom, having been adopted at different times previous to the Revolution.

The ancient national flag of England was the banner of St. George (a white field with a red cross).

The cross of St. George, as early as the 14th century, had been a badge almost universally worn by the English soldiery. It was worn over the armor, and was afterwards adopted as the national standard. This formed the national colors of England till 1606, when, by royal proclamation, the cross of St. Andrew (a white cross on a blue field), which had been the badge of the Scots as early as the Crusades, was united with it. This standard was called the "King's Colors," and was required to be displayed from the maintop of British vessels; those from South Britain to carry the St. George's cross, and those from North Britain the St. Andrew's cross, from the foretop. As the "King's Colors" were prescribed authoritatively for "subjects traveling by sea" only, it is probable that the St. George's cross-flag continued to be used quite generally by the *English* subjects of Great Britain.

It appears to have been in use in Massachusetts, from the following curious circumstance: It seems from the early records that, in 1635, complaint was entered "that the ensign at Salem was defaced; viz., one part of the red cross was taken out." On an examination of the case before the General Court, it was shown that the mutilation was done, not from disloyalty to the flag, but "upon this opinion: That the red cross was given to the King of England by the Pope, as an ensign of victory, and so a superstitious thing, and a relic of Antichrist." The account continues: "Because the Court could not agree about the thing, whether the ensigns should be laid by in regard that many refused to follow them, the whole case was referred to the next General Court; and the commissioners for military affairs gave orders, in the mean time, that all ensigns should be laid aside."

During the interim, a new flag, having for an emblem the red and white roses in place of the cross, was proposed; and letters in relation to the matter were written to England for the purpose of obtaining "the judgment of the most wise and godly there."

This project seems to have been relinquished; for in December, 1635, the military commissioners "appointed colors for every company, leaving out the cross in all of them, and appointing the King's Arms to be put into that of Castle Island (Boston.)"

The next year, however, a difficulty arose between the authorities and the masters of some English ships, in consequence of the "King's Colors" not being displayed from the fort on Castle Island; and "the Governor, with the consent of Mr. Dudley, gave warrant to Lieut. Morris to spread the King's Colors at Castle Island when the ships passed by, yet with this protestation: That we hold the cross in the ensign idolatrous; but, this being the King's fort, the Governor and some others were of opinion that his own colors might be spread upon it." There being no "King's Colors" to be found to display at the fort, they were presented by Capt. Palmer, of one of the ships, "and the Governor in requital sent him three beaver-skins."

This flag was used only at the castle, being excluded by religious opinion from general use. The one containing the king's arms continued to be used till after the establishment of the republic in England. The Parliament had adopted, as the colors of England, the old standard of the cross of St. George; and in 1651, the General Court of Massachusetts ordered that, "as the Court conceives the old English colors now used by the Parliament of England to be a necessary badge of distinction betwixt the English and other nations in all places of the world till the State of England shall alter the same, which we must desire, we, being of the same nation, have therefore ordered that the captain of the Castle shall presently advance the aforesaid colors of England upon the Castle upon all necessary occasions."

The St. George's cross-flag appears to have been used in the colonies, but frequently with some variations, during the next half-century, or until the "Union Flag" was prescribed by Parliament, in 1707. A crimson flag, of which the Union was a St. George's cross on a white field, was one most frequently used. Sometimes a pine-tree was represented in one of the squares formed by the cross. Another flag, represented in a work of the time and called "the flag of the New England Colonies," had a dark-blue field with the cross on a white field in the corner; while, in place of the pine-tree, a half-globe was represented.

These various departures from the English flag, assuming standards of their own, indicate a growing feeling of independence among the colonies; while the absence of a desire for a separation from the mother-country is evident in the acknowledgment of allegiance implied by representing on them the colors of England; or, when from tenderness of conscience these were left out, the arms of the king. By act of Parliament, January 16, 1707, ratifying the treaty of the union of the two kingdoms of England and Scotland, it was ordained "that the ensign armorial of our Kingdom of Great Britain" should be "the crosses of St. George and St. Andrew conjoined" (the same as heretofore described as the "King's Colors"); to be "used in all flags, banners, standards, and ensigns, both at sea and land," and "the ensign described on the margent hereof (the crosses conjoined in the corner of a crimson banner) to be worn on board of all ships or vessels belonging to any of our subjects whatsoever." These flags were known familiarly as "Union Flags," typifying the union of England and Scotland, and were generally used by the colonies till their rupture with the mother-country.

The necessity for union which then existed among the different colonies led to the adoption of badges and flags; and we find this sentiment plainly represented in many of them.

A committee of conference, consisting of Dr. Franklin, Mr. Lynch, and Mr. Harrison, was appointed by the Continental Congress to consider the subject of a proper flag. It assembled at the American camp at Cambridge, and on the first day of January, 1776, in honor of the organization of the new army, was first displayed the flag of the United Colonies. It was composed of seven red and six white stripes, with the red and white crosses of St. George and St. Andrew conjoined, on a blue field in the corner, denoting the union of the colonies, while acknowledging their continued allegiance to Great

Britain, and was named "The Great Union Flag."

This was the basis of our present national colors.

In the mean time, various flags had been adopted by different colonies or bodies of troops assembled to resist the aggressions of the mother-country. For the Connecticut troops in 1775, was prescribed "one standard for each regiment, to be distinguished by their color; for the seventh, blue; for the eighth, orange, etc." Upon these standards were represented the colony arms, with the motto, "Qui transtulit sustinet" ("He who transplanted us will sustain us"), round it in letters of gold. The flag displayed by Gen. Putnam on Prospect Hill, July 18, 1775, is described as a red flag bearing the motto of Connecticut, "Qui transtulit sustinet," on one side, and on the other "An appeal to Heaven." The flag of the floating-batteries had "a white ground, a tree in the middle, and the motto, 'Appeal to Heaven.'" Trumbull, in his celebrated picture of the battle of Bunker's Hill, has represented our troops as displaying a flag combining the two last mentioned,—a red flag with the pine-tree on a white field in the corner,—and such a flag was probably used in that battle.

The first American flag displayed in South Carolina was at the taking of Fort Johnson by Col. Moultrie, September 13, 1775, described as a large blue flag with a crescent in one corner.

In many of the camps red flags were used.

But these various banners were all supplanted by the "Great Union Flag."

For use in their infant navy, other flags were also appointed. On February 9, 1776, Col. Gadsden presented to Congress a standard to be used by the American navy, representing, in a yellow field, a rattlesnake of thirteen rattles, coiled to strike, and the motto, "Don't tread on me."

The device of a rattlesnake was a favorite one with the colonists at this period, and was frequently adopted as a heading by many of the newspapers of the day; being represented divided into thirteen parts, with the initial of one of the colonies in each part, and accompanied by the motto, "Join or die."

The Massachusetts Provincial Congress adopted a flag to be used by the cruisers of the colony of Massachusetts,—a white flag with a green pine-tree, and the inscription, "Appeal to Heaven"; being the same flag as that used on the floating-batteries and before described. The "Great Union Flag," without the crosses, and sometimes with a representation of a rattlesnake, and the motto "Don't tread on me," was also used as a naval flag, and denominated "the Continental Flag."

During the war of the Revolution, flags with significant and appropriate devices were occasionally adopted and borne by some of the corps; many of which, by the valor of the corps to which they belonged, have become historic. Such was the flag of the "Culpepper Minute-Men," who assembled in obedience to the call of Patrick Henry, upon which was represented a rattlesnake and the mottoes "Don't tread on me," "Liberty or Death," and the name of the corps, "Culpepper Minute-Men." Such, also, was the flag of the "Morgan Rifles," which bore upon its field the date "1776," surrounded by a wreath of laurel, the inscription "XI. Virginia Regiment," and the words "Morgan Rifle Corps." And the Pulaski banner, prepared by the nuns of Bethlehem, and sent to Count Pulaski "with their blessing," while he was organizing a corps of cavalry in Baltimore; this was of crimson silk, emblazoned with emblems wrought with the needle by their own hands. The Life-Guard of Washington bore a banner of white silk, with devices, and the motto of the corps, "Conquer or die," painted upon the field.

The "Great Union Flag," however, which was first unfurled on the 1st of January, 1776, over the new Continental army at Cambridge, consisting of but 9659 men, was used as the banner *par excellence* of the United Colonies.

A standard for the United States was not adopted till some months after the Declaration of Independence. Congress, on the 14th of June, 1777, passed the following resolution, which, however, was not made public till September 3 of the same year: "Resolved, that the flag of the thirteen United States be thirteen stripes, alternate red and white, that the union be thirteen stars, white in a blue field, representing a new constellation."

The new constellation which it was intended should be represented is supposed to be Lyra, which in ancient times was the symbol of harmony and unity among men. The difficulty of representing a constellation on a standard probably led to a modification of the plan, and a *circle* of thirteen stars was chosen, signifying union and eternal endurance. Red is an emblem of courage and fortitude; white, purity; and blue, constancy, love, and faith.

This flag was used at the surrender of Burgoyne, October 17, 1777.

The first change in this flag was in 1794, when it was enacted by Congress in the following resolution: "That from and after the first day of May, Anno Domini one thousand seven hundred and ninety-five, the flag of the United States be fifteen stripes, alternate red and white. That the union be fifteen stars, white in a blue field." Approved January 13, 1794.

The next change was in 1818, the resolution of Congress being as follows: "That, from and after the fourth day of July next, the flag of the United States be thirteen horizontal stripes, alternate red and white; that the union be twenty stars, white on a blue field; and that, on the admission of a new State into the union, one star be added to the union of the flag; and that such addition shall take effect on the fourth day of July next succeeding such admission." Approved April 4, 1818.

Flags are also used as distinguishing marks of the flag-ships of admirals, vice- and rear-admirals; they are of blue bunting, are worn at the main, fore, or mizzen, and contain four, three, or two stars, according to the grade of the officer. When two or more flag-officers of the same grade are in company, the senior flies the blue, the next in rank the red, and the others the white flag. The distinctive flag of the Secretary of the Navy is worn at the main of the vessel in which he is embarked. When the President is on board a man-of-war, the fact is denoted by the hoisting of the national colors at the main.

Flags are also used for signaling. (See SIGNALS.) Those which are hoisted at the yard-arms or mast-heads are made of some light rough

material, as bunting, that a very light breeze may cause them to blow out; those which are made use of in signaling by hand are made of some light smooth material, which offers little resistance to the passage of the flag through the air. A black flag is usually adopted by pirates; a white flag is shown as a token of surrender or as a flag of truce (which see); a red flag is hoisted when powder is being received or discharged, and it is also shown as a defiance; a yellow flag is hoisted at the fore when there is any infectious disease on board, being used by all civilized nations as a quarantine flag. *To hang out the white flag*, to call for quarter, or to indicate friendly intentions. *To hang out a red flag*, to give a signal of defiance. *To lower* or *strike the flag*, to haul it down as a token of submission. *To flag*, to send a signal-message by means of a hand-flag.

FLAG-CAPTAIN. The commanding officer of a flag-ship.

FLAG-LIEUTENANT. A term for an aid to the commander-in-chief.

FLAGMAN. A man who handles a hand-flag in signaling.

FLAG-OFFICER. An admiral, vice-admiral, rear-admiral, or commodore.

FLAG OF TRUCE. A white flag which is shown to denote a desire to communicate with the enemy. A flag of truce is, in its nature, of a sacred character; and the use of it to obtain knowledge or information surreptitiously against the interests or wishes of an enemy is to abuse it, and will subject the bearer to punishment as a spy. The senior officer present is alone authorized to dispatch or to admit communication by a flag of truce. Flags of truce should never be permitted to approach sufficiently near to acquire useful information. The firing of a gun is generally understood as a warning not to approach nearer. On the water, a flag of truce should be met at a suitable distance by a boat from the senior officer's vessel, in charge of a commissioned officer, having a white flag plainly displayed from the time of leaving until her return. In dispatching a flag of truce the same precautions are to be observed. When a flag of truce is admitted, the ensign is always to be hoisted and a white flag at the fore on board the vessel of the senior officer present when no engagement is in progress, and kept flying until the flag of truce from the enemy has returned within his lines. A flag of truce cannot insist on being admitted, and should rarely be used during an engagement; if then admitted, there is no breach of faith in retaining it. Firing is not necessarily to cease on the appearance of a flag of truce during an engagement, and should any person connected with it be killed, no complaint can be made. If, however, the white flag should be exhibited as a token of submission, firing is to cease. See TRUCE.

FLAG-SHARE. The commander-in-chief's share of the prize-money awarded to all vessels making captures within the limits of his command.

FLAG-SHIP. A vessel flying the distinctive flag of an admiral or the broad-pennant of a commodore.

Flake. A swinging stage hung over the stern.

Flam. A puff of wind. A shallow spot.

Flam-few. The glimmer of the moon on the water.

Flan. A sudden flaw of wind from the land.

Flanche. To belly out; to flare.

Flange. In mechanism, projecting parts by which one portion of a machine or structure is bolted or riveted to another; as, flanges of pipes, columns, cylinder-heads, boiler-plates, etc. Flanges may project either externally or internally.

A projecting rim of a wheel, as applied to railway locomotive or car-wheels to constrain them to the track.

Flap. The cover of a cartridge-box. The violent motion of a sail, caused by the wind or the rolling of the vessel.

Flare. The skate, *Raia batis.* To project beyond the perpendicular; opposed to *tumble home.*

Flash. In timber, the marks of the grain. A river opening into a bay, separated from the sea by a reef of rock. A canal at the side of a river, arranged so as to pour its waters into it, and thus shoot boats over falls. To burn loose powder, producing flame but no noise. *Flash in the pan*, to miss fire; to fail; an unsuccessful attempt. *To make a flash*, to shoot a boat over rapids by a flash.

FLASHING LIGHT. See LIGHTS.

FLASHING SIGNALS. See SIGNALS.

FLASH-RIM. A cup-shaped enlargement of the bore of carronades, facilitating loading, and preserving the rigging from flame.

FLASH SHIP. A ship all paint outside and disorder within; a showy but not efficient vessel.

Flask. A horn, leather, or metal implement, for holding powder. Priming-flasks are supplied to prime guns for salutes in the navy. A box to contain a mold for castings.

Flat. Horizontal; level. A straight part in a curve. A bank over which the tide flows; if of less than 3 fathoms it is called a shoal, shallow, or bar. A flat-bottomed lighter. The position of a sail when the yard is sharp up, the sheets close home, and the halliards taut up, or, in other words, when it lies as nearly as possible in the direction of the keel. A sheet is *flat aft* when it is hauled as much as possible in the direction of the keel,—applied to fore-and-aft sails. *Flat aback*, see ABACK.

FLAT-BOTTOMED. Having little rise in floor timbers; flat-floored.

FLAT-CALM. See DEAD-CALM.

FLAT-FISH. Sole, turbot, etc., which swim on one side, and have the eye in the upper side.

FLAT-FLOORED. Having the bottom timbers lying nearly in a plane perpendicular to the plane of the keel.

FLAT NAILS. Sharp flat-headed nails used in the mold-loft.

FLAT-SEAM. When two edges of canvas are overlapped, and thus sewed together, it is called a *flat-seam.*

FLAT SEIZING. A seizing with no riding turns.

FLAT SENNIT. See SENNIT.

FLATTEN-IN. To haul the sail as nearly fore and aft as may be to produce only its lateral effect. Head-sails are flattened-in to pay the ship's bow off, or turn it from the wind.

Flaut. See FLUTE.

Flaw. A defect in wood, metal, etc. A puff of wind.

Fleak. See DUTCH PLAICE.

Fleate. To skim fresh water off the sea near the mouths of rivers.

Flechera. A fast dispatch-boat used in South American waters.

Fleech. A slab-cut of timber.

Fleet. To pass over quickly; to skim over the water. To shift from one place to another. To pull the blocks of a tackle farther apart. "*Fleet ho!*" "Let go and shift!" said when the blocks come together, rendering it necessary to pull them apart. To shift the turns of a rope farther down on the capstan. *Fleet the messenger*, to shift the eyes past the capstan. An arm of the sea where the tide flows. A bay where vessels can anchor. A shallow tidal creek. The whole naval force of a country. A collection of ships, either war or merchant. A fleet is divided into divisions and squadrons, the centre being under the commander-in-chief, and the van and rear under subordinates. The admiral, vice- and rear-admiral occupy these posts when at sea. A small fleet is called a flotilla, and the same name designates a large fleet of small vessels or boats. Fleets of great size were early used. The Persians first assembled great numbers of ships, and the Carthaginians and Romans counted them by hundreds. The Danes and Normans, in their early incursions, had from 200 to 600 vessels, and William the Conqueror came to England with 1000 vessels. In the early naval history of England from 200 to 500 ships sailed together, and they collected more than 1000 vessels during the early wars with France; on several occasions Louis IX. of France had 1700 vessels,—on his expedition to the Holy Land. The Great Armada consisted of only 150 vessels, varying from 300 to 1200 tons. During the Dutch and English naval wars, and the French and English wars, fleets of nearly a hundred ships of the line, and sometimes more, were common. With a great increase in the size and cost of ships, and greater individual power of each, large fleets will be the exception in the future. A designation of the divisions of the cruising navy of the United States, as the European Fleet, the North Atlantic Fleet, the Pacific Fleet, and the Asiatic Fleet. *Squadron* is also here employed.

FLEET-CAPTAIN. The senior aid of the admiral of a fleet, when a captain. See CHIEF-OF-STAFF.

FLEET-GIG. The gig of the fleet-captain.

FLEET-PAYMASTER, -SURGEON, -ENGINEER, and MARINE OFFICER. The ranking officers of those corps attached to the staff.

FLEET-TACTICS. See NAVAL TACTICS.

FLEET-WATER (*Eng.*). Water that overflows the land.

Flemish. To coil down a rope in concentric coils, closely pressed together. See FAKE.

Flemish Accounts. Short or deficient accounts.

Flemish Eye. See EYE, FLEMISH.

Flemish Fake. A fake or coil of rope in which the separate turns are concentric, and lie flat on the deck, without riding over each other.

Flemish Horse. The outer or short foot-rope of a yard. It is spliced around a thimble at the yard-arm, and has the other end seized to the yard some distance inside.

Flench-gut. Long slices of whale's blubber.

Flense. To strip off the blubber of a whale.

Flesh. *To flesh a sword*, to use it in action the first time.

Flesh-traffic. The slave-trade.

Flibot. See FLY-BOAT.

Flibustier (*Fr.*). See FILIBUSTER.

Flicker. To veer about; as the wind.

Flidder. The limpet (*Ancylus*).

Flighers. An old law-term for masts.

Flight. A Dutch canal-boat for passengers. A sudden rise in the lines of a ship. The passage of a projectile through the air.

Flinch. See FLENSE.

FLINCH-GUT. See FLENCH-GUT.

Flinders. Splinters of wood.

Flint. Stone to strike fire with,—provided to boats and for the galley. Matches are forbidden on board ship.

Flip. A drink composed of beer, spirits, and sugar.

Flipper. A fin; the hand.

Flitch. The outside cut of a tree or log.

Flittering. Old English for floating.

Flizzing. Flight of a splinter through the air,—from the Dutch *flissen*, to fly.

Float. A place or basin where vessels float. Inner part of a ship-channel. In wet-docks, the basin where the water is maintained at one level by locks. A raft of timber, boxes, or barrels. A camel or floating-stage. The paddle of a paddle-wheel. Any buoyant body used to constrain another body in a constant relative position to the surface of a liquid. To swim on the surface of the water.

FLOATAGE. Same as flotsam (which see).

FLOAT-BOARDS. The boards fastened radially on the rim of a paddle-wheel.

FLOATING ANCHOR. A sea-anchor.

FLOATING BATTERY. A vessel constructed to float in smooth water, carrying a heavy battery, and strongly protected by plating. A vessel used as a battery to support the landing of troops. The first use of a floating battery is traced far back into antiquity, when two or more galleys were united, with catapults, battering-rams, etc., on their decks, to attack towns. The Knights of St. John, at Malta, first protected a battery with metal, using lead, in 1530. In modern times, the floating batteries used at Gibraltar in 1779–83 are first met with. These were ten in number, and were protected with timber, junk, and hides. In 1855 the French constructed floating batteries at Kinburn, in the Crimea, and these were effective, and some still remain in use. Four of them are of 280 tons and carry two 5½-inch guns, and one is of 140 tons, carrying two 6-inch guns. Spain has two,—the "Duque de Tetuan" and the "Puigcerda." Many modern armored vessels are simply floating batteries with motive-power.

FLOATING BETHEL. An old ship fitted up as a chapel.

FLOATING BREAKWATER. A system of anchored cribs, serving to break the force of waves.

FLOATING BRIDGE. A bridge of boats. A ferry-boat, running on chains laid in a narrow channel.

FLOATING COFFIN. A name for a vessel which is considered unseaworthy, particularly applied to our monitors and old brigs, the old English 10-gun brigs, and to the very long passenger steamers engaged in the transatlantic trade.

FLOATING DAM. The caisson of a dry-dock.

FLOATING DERRICK. The application of the Bishop's derrick to a large scow of such a capacity as to handle the heaviest weights, such as the boiler of a steamship, and which is also fitted with a sufficient steam-power, in order that the scow and weight appended can be transported from one place to another in a harbor. It is useful also in many other ways.

FLOATING DOCK. A dock built for the repairs of ships, which is floating instead of being formed by excavations. There are several kinds of floating docks, known as the sectional, balance, and hydraulic docks.

FLOATING LIGHT. A vessel moored off a shoal or rocks with a light at its mast-head. There are 25 light-ships on the coast of the United States, with 35 lights. A light erected on a buoy or floating-stage. Buoy-lights are now furnished with gas-tanks in the buoys, in some instances.

FLOATING PIER. A stage or camel floating on the water, rising and falling with the tide.

FLOAT-VALVE. A valve connected with a float so that it may be automatically opened, closed, or regulated according to a varying surface of a liquid.

Floe. A detached portion of an ice-field. See CALF.

Flog. To punish by striking with the cat-o'nine-tails. This punishment is now forbidden in our service, though quite common in some others, particularly the Russian. *To flog the glass*, to agitate and so hasten the flow of sand through it; sometimes practiced in early days by the midshipmen eager for their watch to be up.

Flome. An old word for a river or flood.

Flood. The flowing in of the tide. The rising tide, known as young flood, high flood, spring flood, half flood, etc. To overflow; to deluge with water; as, to flood the magazine. See TIDE.

FLOOD-ANCHOR. See ANCHOR.

FLOOD-COCKS. The cocks that are fixed in pipes leading from the ship's side below the water-line into the magazine, used to flood the latter in case of fire. These cocks are turned by levers from the deck.

FLOOD-MARK. A mark placed on the shore or a wharf at the highest tide; high-water mark. In England it marks the extent of Admiralty jurisdiction.

Flook, or Fluck. A flounder; a flat-fish.

Floor. All that part of a ship on either side of the keel which approaches nearer to a horizontal than to a perpendicular direction.

FLOOR-HEADS. The outer ends of the floor-timbers.

FLOOR-PLAN. A plan of the floors or bottom timbers of the ship, upon the drawings of the ship, or the mold-loft floor.

FLOOR-RIBBAND. The ribband next below the floor-heads.

FLOOR-SWEEPS. Radii that sweep the heads of the floors. It is an old method of construction, not used nowadays.

FLOOR-TIMBERS. The lower timbers of the frame of a ship placed square across the keel, and which are consequently thoroughly secured to the keel.

Flory-boat. A small boat used to carry passengers from steamers to the shore.

Flosh. A weedy marsh on the sea-shore.

Flosk. The sea-sleeve, anker-fish, cuttle-fish, or squid (*Sepia loligo*).

Flota. The fleet of Spanish galleys that yearly sailed to Mexico in the 17th century.

Flota Navium. An old term for *fleet*.

Flote. An old term for *wave*.

FLOTE-BOTE. An old term for a yawl or row-boat.

Flotilla. A fleet of small vessels.

Flot-mann. A very old term for a sailor.

FLOTSAM, or FLOTSON (*Law*). Goods floating on the sea, as distinguished from *jetsam*, or goods thrown into the sea, and which, sinking, remain under water; and also from *ligan*, those cast into the sea and buoyed. In olden times, such goods belonged to the finder; later, they were the property of the sovereign; at present, salvage or wreckage is allowed on them.

Flounder. The flat-fish (*Platessa flessus*); called also *floun-dab*.

Flow. To move in a steady stream. The rising of the tide. The current of a river. The direction or set of a current. *To flow the head-sheets*, to ease them off so the wind will have no effect on the head-sails.

FLOWING. The position of a sheet when it is eased off.

Flower of the Winds. The old compass painted on charts, a rose or lily being drawn in its centre.

Flowering. The shoals or strata of fish-feed, often seen in the water about spawning-time.

Flowing Hope. See FORLORN HOPE.

Flue. The fluke of an anchor. A passage for distributing the gaseous products of combustion of a furnace, or conveying them to a chimney. In steam-boilers, metallic flues surrounded by water constitute the larger portion of the fire or heating surface. Small cylindrical metallic flues are called tubes.

FLUE-BOILER. A steam-boiler in which the fire or heating surface is chiefly in flues instead of tubes.

FLUE-SURFACE. The aggregate surface of flues exposed to heat.

Fluffit. The movement of the fins of a fish.

Fluid Compass. See COMPASS.

Fluke. The large triangular tail of the whale. The triangular blade at the end of the anchor-arms, that forms a holding surface when the anchor is down. See ANCHOR.

Flummery. A dish of oat-meal.

Flurry. The movements of a dying whale. A light breeze of wind, agitating the surface of the sea. Haste and confusion.

Flush. Even; level. Well provided with money.

FLUSH DECK. A deck extending from stem to stern without a break.

Flustered. Excited or worried.

Flute, or Fluyt. A pink-rigged fly-boat, the after-part of which is round-ribbed. *Armed en flûte*, partially armed.

Flute-mouth. A fish of the genus *Fistularidæ*, with a snout drawn out into a tube.

Fluvial. Belonging to a river.

FLUVIAL LAGOON. A shallow lagoon, formed on the sea-coast by the action of a river.

FLUVIO-MARINE. The combined action of river and sea.

Flux. The coming in of the tide. In chemistry and metallurgy, any substance or mixture used to promote the fusion of metals or min-

erals, as alkalies, borax, etc. In large operations, limestone is extensively used. The action of a flux is to combine with the more refractory or infusible components of an ore or mineral, leaving the pure metal alone exposed to the action of the heat, as in smelting silicious iron ores with lime flux, where the infusible lime combines with the silica, forming "slag," which separates from the metal.

Fly. In mechanism, a contrivance for resisting acceleration or retardation of movement in a machine when the ratio between the motive force and the resistance to be overcome in performing work is variable. When used to prevent accelerated motion only, as when the motive force is a descending weight or released spring acting against a nearly constant resistance, a fly consists of two or more radial arms, fixed to a rapidly revolving spindle or shaft so as to revolve with it, to the ends of which are attached thin vanes or plates presenting their flat surfaces to the resistance of the atmosphere or other fluid. This device is familiar in striking-clocks and certain automatic musical instruments. When used to prevent fluctuations of speed arising from an alternately varying ratio between force applied and resistance to be overcome, weights are substituted for vanes, which, by their moment of inertia, absorb the energy of acceleration when the motive force exceeds the resistance, and yield it when the resistance exceeds the force. The part of a flag from the union to the extreme end. The compass-card. To move quickly or suddenly; as, to *fly* up into the wind. To float in the wind; as, a flag at the mast-head. *To let fly*, to let go; as, to let fly the sheets. *To fly about*, to chop about.

FLY-AWAY, CAPE. See CAPE FLY-AWAY.

FLY-BLOCK. The upper block of the topsail halliards.

FLY-BY-NIGHT. A square-sail, set like a stun'sail, used by sloops before the wind. A jib used as a stun'sail, extending from the topmast head.

FLYER. A clipper. A fast sailer.

FLY-GOVERNOR. A governor in which uniformity of motion is secured by means of fly-vanes. See GOVERNOR.

FLYING DUTCHMAN. A traditional spectre-ship, seen near the Cape of Good Hope. The legends are numerous, but owe their origin to a tale of a Dutch skipper, who, baffled long by head winds, swore he would double the cape in spite of God and man. Thenceforth his ship sailed without chart or compass, and is seen in all weathers, sometimes with little sail in a calm, sometimes with all sail in a tempest. Sailors also ascribe to its influence white squalls, shipwrecks, and other disasters. Sometimes it visits passing ships, when wine sours, and other disasters happen. Sometimes mail is sent from it, when the unlucky ship is never again heard from. His appearance constantly changes, so that he is never recognizable. His crew is composed of the spirits of old thieves, skulkers, and other outcasts from ships. Many other legends are connected with the famous Hollander, and the theme has furnished literature and music with much material.

FLYING FISH. Fish of the genus *Scombere-socidæ*, or *Sclerogenidæ*, whose pectoral fins are prolonged into a species of wings, smooth-edged, and which jump out of the water long distances. Sometimes the name is applied to the flying gurnard.

FLYING GURNARD. A fish of the genus *Dactylopterus*. These resemble flying fish, but their wing-bones are prolonged beyond the membranes, and they have a spine on the head. Both these and flying fish are edible, and abound in tropical waters.

FLYING JIB. The outermost jib, or sail, on the bowsprit, used as a jib to turn the ship's head. It is generally taken in and set with royals, is one of the light sails, and sets on a stay leading to the fore-topgallant mast-head, through the boom end. For the gear of the flying jib see under proper heads.

FLYING JIB-BOOM. The light boom which extends beyond the jib-boom. It is an outrigger for the stay, and lies along the jib-boom for half of its length, being secured by a belly-lashing to it, and by a heel-clamp to the bowsprit-cap, while it passes through a wythe on the boom end. For the rigging of the jib-boom see under proper heads.

FLYING KITES. Those lofty sails, now obsolete, formerly carried above the royals; as sky-sails, moon-sails, star-gazers, etc.

FLYING LIGHT. The state of a ship when she has little cargo, and is light in draft.

FLYING PROA. A kind of double canoe of the Ladrone Islands. The lee side is flat, keeping the craft up to the wind in the same manner as a lee-board or centre-board. A smaller canoe is attached to an outrigger rigged out to windward; when the wind freshens a man is sent out on the outrigger. It carries an enormous triangular sail, and sails very close to the wind, to which it always presents the rounded side. It is very light, being held together with coir yarns.

FLYING SQUID. The genus of *Cephalapod* fish called *Ommastrephes*. It sometimes jumps high out of the water.

FLYING STUN'SAIL. A stun'sail set flying, between the masts.

FLY-WHEEL. A wheel with a heavy rim, which, by its great moment of inertia, accumulates the energy of acceleration, and yields it when motion is retarded, as in equalizing the motion of a crank, or overcoming the resistance of suddenly applied work, as in rolling-mills.

Foam. Froth produced by agitating the waves, or arresting their motion. A liquid holding such a quantity of vapor or gas in suspension as to cause it to form a mass of small bubbles.

FOAM-COCK. A cock to blow off the foam.

FOAMING. In steam-enginery, a condition of the water in a boiler when in a state of foam. The principal causes of this condition are impurities in the water, which are either very volatile or tend to make it viscid, or a higher temperature of the water than is due to the steam-pressure. The latter state may result from temporarily drawing the steam from the boiler more rapidly than it can be formed at the proper temperature and pressure. Foaming endangers both boiler and engine; the former, because the true water-level cannot be ascertained, and the latter, because the water is carried bodily into the cylinder, producing destructive shocks.

Focal Distance. The distance between the object-glass and the image.

Fœnus Nauticum. Usury or bottomry.

Fog. Watery vapor, precipitated in the lower atmosphere, causing a mist or obscurity. Fogs are produced by the rapid cooling of the atmosphere near the earth, causing it to part with its moisture. They are common near banks where currents meet, and hover about the banks of the Gulf Stream. In northern latitudes they are very prevalent. Dry fogs, or dust-clouds, are also met with on the coast of Africa. Fog is generally a sign of good weather.

FOG-ALARM. An audible signal to warn vessels from rocks, shoals, or other dangerous places. The sound is made by a bell, trumpet, or whistle, and the apparatus may be worked by the heaving of the sea, by the effect of the tide or current, or by machinery. A notable fog-alarm was the bell on the Inchcape rock; the clapper was moved by the action of the waves.

FOG-BANK. A dense fog lying in a cloud or bank about the horizon. Lying at the water's edge it resembles land, and has led to those illusive appearances called Dutchman's land, Cape Fly-away, No-man's land, Butter-land, etc.

FOG-BELL. A bell rung to warn ships during fogs. When ships are at anchor a bell is thus rung. Bells are placed on buoys or on frame- or iron-work at sea in the vicinity of shoals to warn ships. Some are arranged to toll automatically by the motion of the waves, tide, or winds. A bell is also sometimes erected, connected with machinery, near a light-house on shore, to ring in case of fog.

FOG-BOW. A bow formed in high latitudes opposite the sun, sometimes white, sometimes prismatic in colors. It is caused by refraction, and is said to indicate the clearing away of fogs.

FOG-DOG. A clearing spot in a fog, or a break in the bank, presaging the lifting of the fog.

FOG-EATER. Much the same as fog-bow and fog-dog, and including both. A break in a fog-bank or mist, a sign of clearing weather.

FOGGY. Abounding with fog. Obscure; beclouded. Half drunk.

FOG-HORN. A horn for making fog-signals.

FOG-RING. A circular bank of fog.

FOG-SIGNAL. A signal made during fog to warn ships from each other's path, or of dangers, such as rocks and shoals. Ships at anchor generally use a bell, and this is used also in other cases. (See FOG-BELL.) Sailing-ships under way use a horn. Automatic horns have been devised, either causing the sound by a motion communicated by the hand, or by the rolling of the ship. Steamers under way use a steam-whistle. More effective signals are desirable, but have not yet been adopted. On shore, besides a bell, a gun has been used, a steam-whistle, and a *siren*, where the sound is caused by blowing air or steam through revolving disks in which holes are cut. Buoys off shore have in many instances automatic fog-whistles attached to them. On the coast of the United States there are 54 fog-signals, 16 of them duplicates. Many of those on the light-vessels are worked by caloric-engines.

FOG-WHISTLE. See FOG-SIGNAL.

Fogram. Liquor of indifferent quality.

Fogy. An old-fashioned person. An increase of pay due to length of service.

Foil. A slender, blunt sword used in fencing.

Folder. The folding sight of a fire-arm.

Folding Boat. A boat made of frame-work and canvas, so as to be folded up into a small bundle.

Follis. A large-meshed net.

Followers (*Eng.*). A captain or flag-officer's servants and boat's crew. Young midshipmen formerly going with the captain from ship to ship.

Fomalhaut. The bright star *a Piscis Australis.* See PISCIS AUSTRALIS.

Foo-Choo. One of the treaty-ports and a large city of China, capital of the province of Fo-Kien, on the Min River, 25 miles from its mouth. Lat. 26° 12′ 24″ N.; lon. 119° 30′ E. It is surrounded by an amphitheatre of hills about 4 miles distant, and is inclosed by a castellated wall 9 or 10 miles in circumference. The whole is commanded by a fortified hill 500 feet above the plain, and inside of the walls is another height crowned by a conspicuous watch-tower. Foo-Choo has a naval arsenal, ship-yards, and a school of navigation. Pop. 500,000.

Foolen (*Eng.*). The space between the high-water mark and the foot of the wall on the banks of a river.

Fool-fish. The long-finned file-fish of the genus *Balistes.*

Foolish Guillemot. The diving-bird, *Uria troile.*

Foot. A linear measure of 12 inches; the foot varies in different countries from 21.022 centimetres to 50 centimetres in length. The lower edge of a sail. *To foot*, to push with the feet; as, to *foot* the fore-sheet clear of the backstays.

FOOT-BOARD. A small board in skiffs, to serve as a stretcher for the foot of the rower. A gang-board.

FOOT-BOAT. A small boat used to carry foot-passengers.

FOOT-BRAIL. See BRAIL.

FOOT-CLEW. The clew at the foot of a hammock.

FOOT-HOOK. Same as futtock (which see).

FOOTING. The fine which a landsman has to pay on first going aloft.

FOOT-POUND. The unit of measure of work, which is a resistance of one pound moved through a space of one foot. See WORK.

FOOT-ROPE. The roping on the foot of a sail. The rope extending under a yard, from near the end to the slings, or middle, for the men to stand on. It is also used on the jib- and flying jib-booms, and on the spanker-boom. They were formerly called horses, and are still supported at intervals along the yard by the stirrups.

FOOT-VALVE. A valve placed between the condenser and air-pump of a steam-engine, and through which the products of condensation are drawn.

Foote, Andrew Hull, Rear-Admiral U.S.N. Son of Gov. S. A. Foote. Born in New Haven, Conn., September 12, 1806; died in New York City, June 26, 1863. Acting midshipman in 1822, he made his first cruise in the schooner "Grampus," sent in 1823 to chastise the West Indian pirates. Lieutenant, May 27, 1830; commander, December 19, 1852. He was flag-lieutenant in 1833 of the Mediterranean Squadron; and in 1838, as first lieutenant of the "John Adams," Commodore Read, circumnavigated the globe, and took part in an attack on the pirates of Sumatra. While stationed at the Naval Asylum,

in 1841–43, he prevailed upon many of the inmates to give up their spirit rations, being one of the first to introduce the principle of total abstinence from intoxicating drinks in the navy, and continued this effort in the "Cumberland," in 1843–45, besides delivering an extemporaneous sermon every Sunday to the crew. In 1849–52, in command of the brig "Perry," he was on the African coast, successfully engaged in suppressing the slave-trade. He published in 1854 "Africa, and the American Flag." He commanded in 1856 the sloop "Portsmouth" on the China station. Arriving at Canton just before the commencement of hostilities between the English and Chinese, he exerted himself in protecting American property, and having been, while thus engaged, fired upon by the Barrier Forts, received permission from Commodore Armstrong to demand an apology for this indignity. This being refused, he attacked the forts, four in number, with the "Portsmouth" and "Levant," breached the largest, and, with 280 sailors, landed and carried it by storm. The remaining forts were successfully carried, with a total loss of 40 to the attacking party. The works were of granite, with walls 7 feet thick, mounting 176 guns, and garrisoned by 5000 men, 400 of whom were killed and wounded. In July, 1861, he became captain, and in September flag-officer of the flotilla fitting out in the Western waters. February 4, 1862, he sailed from Cairo with seven gunboats, four of them ironclads, to attack Fort Henry, on the Tennessee River. Without awaiting the co-operation of Gen. Grant, he attacked the fort at noon of the 6th, and in two hours compelled its surrender. On the 14th he attacked Fort Donelson; but the fleet was obliged to haul off just as the enemy's water-batteries had been silenced, two of the gunboats having become unmanageable. Foote was severely wounded in the ankle by a fragment of a 64-pound shot. Though on crutches, he proceeded down the Mississippi with his fleet and a number of mortar-boats to besiege Island No. 10. After its reduction, April 7, he returned to New Haven. Regaining his health, he was made chief of the Bureau of Equipment and Recruiting. July 31, 1862, he was appointed rear-admiral on the active list. On Admiral Dupont's being relieved from his command of the South Atlantic Blockading Squadron, May, 1863, Admiral Foote was appointed to succeed him.

Forbin, Claude (Chevalier, and afterwards Count de), a very celebrated French sailor, was born near Aix, in Provence, in August, 1656, and died at Saint Marcel, near Marseilles, on the 4th of March, 1735. His name has often been confounded with two others of the same family who bore the title of chevalier,—one of whom was his uncle.

The Count de Forbin wrote his own memoirs,—almost the exception in the case of French seamen of the period,—the other one who has given us his life being Duguay-Trouin. Forbin most unjustly abuses his contemporaries,—even Jean Bart and Duguay-Trouin,—but, with that exception, his "Memoirs" are both amusing and instructive.

From Forbin's own showing it appears that, from extreme youth to the age of nineteen he was involved in every species of dissipation, debt, gambling, and, moreover, a great duelist.

In 1675 he entered the galley service as a "standard bearer," making several cruises. This grade being suppressed in 1676, Forbin entered the land service, in a corps of musqueteers, commanded by a relative, and made a campaign in Flanders.

In 1677 he re-entered the marine, as *ensiegne de vaisseau.* He soon lost his commission, however, and was even condemned to decapitation, for having killed another officer in a duel. After a time he was pardoned for this offense, and actually contrived to again enter the navy, as an *enseigne de vaisseau*, by substituting himself for a brother whom he much resembled, and who was prevented, by ill health, from going to sea.

In 1680, Forbin served with D'Estrées in the West Indies, and in 1682–83, with Duquesne at the bombardments of Algiers. For his coolness and bravery on these occasions he was made *lieutenant de vaisseau.*

Two years later he was a member of the embassy sent to the King of Siam by Louis XIV., and the Eastern monarch was so pleased with Forbin that he retained him at his court, and made him admiral, and general in his army, besides bestowing upon him other high dignities. Forbin appears to have very soon got tired of it all, and obtaining leave, on account of his health, to go to the French colony of Pondicherry, he thence, without further ceremony, returned to France, where he appeared at court, and amused Louis XIV. with his descriptions of court-life in Siam.

In 1689, after the rupture of the peace of Nimeguen, Forbin re-entered active service, receiving a commission as *capitaine de frégate.* In this capacity he served under Jean Bart, and, forming part of the escort of a convoy, had a desperate fight with two English vessels of greater force. They were both captured, both made prisoners, and both made escapes remarkable for the endurance and intrepidity shown, and were both, as a reward, made *capitaines de vaisseau.* Forbin almost at once went to sea again, in a low, fast-sailing vessel called the "Marseillaise," and became a scourge to the commerce of the English. The year after, he commanded the "Fidèle," in the battles under Tourville, and afterwards cruised in the North Sea.

In 1692 he again served under Tourville at the disastrous battle of La Hogue, where he was most severely wounded in the knee, and his ship, "La Perle," was cut to pieces, and very nearly burnt by fire-ships. In spite of all this he succeeded in getting in to Saint Malo.

Having recovered from his wounds, Forbin next served under Jean Bart, in his celebrated cruise in the North Sea, where he inflicted such damage on the Dutch and English commerce.

In 1693 he served in the brilliant action off Lagos, where Tourville dispersed and ruined the great Smyrna fleet and its escort. Forbin here captured three ships and burnt a fourth. He continued constantly in service, both in the North Sea and in the Mediterranean, and as a reward for his services was, in 1699, made a Chevalier of St. Louis.

During the war of the Spanish Succession he had a separate command in the Adriatic, where he burnt Trieste, and so preyed upon Austrian commerce that the prayers of the Dalmatian

sailors, on going to sea, was that they might not encounter the Chevalier de Forbin.

In 1706–7 he took or destroyed, in the North Sea, more than 180 English and Dutch vessels, and was made *chef d'escadre* and count.

The next cruise he made was to the White Sea, and the result was the ruin of the fisheries for that season. In the same year, 1707, he came south with his squadron to join that of Duguay-Trouin, and, together, they fought a large English squadron. Owing to some misapprehension of orders, Forbin did not arrive in line until late in the day, which caused a drawn battle, although the English suffered most damage.

In 1708, Forbin was commissioned to conduct to Edinburgh the Pretender, the Chevalier St. George, son of James II. Forbin was much blamed for the non-success of the Pretender's venture, and, being already dissatisfied because he had not been made lieutenant-general of the marine, he abandoned the naval service, and settled down near Marseilles, where he died. He was a brave man, and a good sailor, but of unmeasured pride, and never made any personal friends. He was 77 when he died, and had served 40 years at sea.—*E. Shippen.*

For-by. Near; close at hand.

Force. A condition between two bodies tending to change their relative positions; its unit of measure is one pound avoirdupois. Strength; power; might. Violence; coercion. Strength or power for war; hence, a fleet or body of troops. To compel; to coerce.

FORCED-MEN. Men who are forced by pirates to serve with them, but who do not sign the articles.

FORCE-PUMP. A pump for forcing a fluid against a resisting pressure; as, the pumps of a fire-engine or the feed-pump of a steam-boiler.

FORCER. Piston of a force-pump.

Fore. The distinguishing characteristic of all that portion of a ship and appurtenances which lie near the stem; the opposite of *aft*, or *after*. *To the fore*, in advance. *At the fore*, at the fore-royal mast-head, said of a flag or set of flags.

FORE-AND-AFT. From stem to stern. In a line parallel to the keel.

FORE-AND-AFTER. A cocked hat worn with the peaks in front and behind. A vessel rigged with fore-and-aft sails only.

FORE-AND-AFT SAILS. Sails that are not bent to yards, but extend from the mast or stay to the lee side of the vessel. They include sails setting on stays, on masts, with gaffs, booms, sprits, and lateen-yards, and are divided into stay-sails (including jibs), trysails (including spanker), lateen-sails, lug-sails, sprit-sails, gaff-topsails, and shoulder-of-mutton sails. They allow the vessel to approach nearer to the wind, as they may be trimmed more nearly in a line with the keel than square-sails. Schooners, sloops, boats, and small craft generally use them, but they also make a part of the sail-rig of every vessel.

FORE-AND-AFT TACKLE. A tackle used in the line of the keel for any purpose.

FORE-BAY. The sick-bay. The galley-room on the spar-deck of merchantmen. The rise of a floor of a lock-gate. See SICK-BAY.

FORE-BODY. That portion of the vessel forward of dead-flat.

FORE-BOOM. An old name for the jib-boom. The boom of a fore-and-aft foresail.

FORE-CABIN. The forward cabin of a vessel.

FORECASTLE. That portion of the spar-deck from the after fore-shroud forward. The name arose from the structure resembling a castle which was formerly erected on the forward part of the spar-deck. A partial deck level with the rail at the forward part of the ship is called a *topgallant forecastle.*

FORECASTLE-AWNING. See AWNING.

FORECASTLE-DECK. The forward part of the upper deck.

FORECASTLE-JOKES. Sailors' practical jokes.

FORECASTLE-MEN. That part of the crew stationed on the forecastle, generally the oldest and most reliable seamen. They handle the head-sails, the foresail and lower studding-sail, work the anchor-gear, clean and keep the forward part of the ship in order, etc.

FORECASTLE-NETTINGS. That portion of the hammock-nettings on or near the forecastle.

FORE-COURSE. The sail bent to the fore-yard. See FORESAIL.

FORE-FOOT. The forward end of the keel.

FORE-GAFF. The gaff of the fore-trysail.

FORE-GANGER. A short piece of rope connecting the line with the harpoon.

FORE-GUY. See FORWARD GUY.

FORE-HATCH. The hatch nearest the foremast, generally abaft it, on all decks.

FORE-HOLD. The forward part of the hold. In it, in men-of-war, are stowed tar, pitch, rigging, anchor-gear, etc.

FORE-LEECH. The luff of a stay-sail or trysail.

FOREMAST. The mast nearest the bow. For the rigging of the foremast, see under proper heads.

FOREMAST HAND, or FOREMAST MAN. A blue-jacket not above the rating of seaman. The term may include all who are shipped "before the mast."

FORE MAST-MAN. A man stationed to attend to the gear of the foremast. See MAST-MAN.

FORE-ORLOP. The part of the ship next forward the hold, and under the berth-deck. On it, in frigates and large sloops, are the sail-rooms, etc.

FORE-PASSAGE. A gangway or passage on the fore-orlop-deck, leading to the *fore-peak.*

FORE-PEAK. That part of the hold in the extreme forward part of the ship, occupied by paint-room, yeoman's store-room, and a block-room in men-of-war.

FORE-RAKE. The part of the ship projecting over the forward end of the keel.

FORE-REACH. To shoot ahead after the propelling power has ceased. To gain ground ahead in tacking.

FORE-ROYAL. See ROYAL.

FORE-RUNNER. The piece of bunting inserted in a log-line, to mark the extent of stray-line, and the point at which the glass must be turned.

FORESAIL. A square-sail, bent to the fore-yard, the lowest on the foremast. The fore-and-aft sail on the foremast of a schooner. The fore-stay-sail of a cutter or sloop. For the gear of the foresail, see under proper heads. See SAILS.

FORE-SHEET HORSE. An iron bar fixed across the deck, for the clew of the fore-stay-sail to travel on.

FORE-SHEETS. The forward portion of a boat having a grating shipped over it. See STERN-SHEETS.

FORE-SHEET TRAVELER. An iron ring or triangle fitted to the clew of a fore-and-aft foresail, running on the horse, so as to traverse the sail.

FORE-SHIP. An old term for the fore part of a ship.

FORE-SPENCER. A name for the fore-trysail.

FORE-STAGE. An old name for the forecastle.

FORE-STAY-SAIL. The stay-sail just forward of the foremast, setting on the fore-stay. In men-of-war it has its own stay, and is only bent in bad weather, and is called the *fore storm-stay-sail.* See STAY-SAIL.

FORE STAY-TACKLE. See TRIATIC STAY.

FORE STUDDING-SAIL. See STUDDING-SAIL.

FORE-TOP. See TOP.

FORE-TOPGALLANT. See TOPGALLANT.

FORE-TOPMAST. See TOPMAST.

FORE-TRYSAIL. See TRYSAIL.

FORE-YARD. The lower yard across the foremast. For the rigging of the fore-yard, see under proper heads. See YARDS.

Forecast. Foresight; forethought. To foresee; to project.

Foreign-built. Built in a foreign country.

Foreland. An advanced headland, cape, or promontory forming the limit of a stretch of coast.

Fore-lock. A flat piece of iron, wedge-shaped, driven in a slit in the end of a bolt, so as to hold it in place. *A spring fore-lock* has a spring, keeping it in place.

FORE-LOCK BOLT. A bolt having a fore-lock attached to it.

Foreness. A peak or promontory.

Fore-staff. A nautical instrument for taking altitudes, now discarded. In the fore-staff, the eye was directed along the instrument to the object. In the back-staff, the image by reflection was used. See BACK-STAFF.

Forge Ahead. To shoot ahead after the sails are in, or steam is shut off. When hove-to, or lying-to, to gain distance ahead.

Forge-over. To force over a shoal or rock. To crowd sail or steam to get over a rock, etc.

Fork of a Stay. The place where a stay is divided into two parts, so as to embrace the mast.

Forkers (*Eng.*). People who reside near a navy-yard for the purpose of stealing, or receiving stolen goods.

Fork-tail. A salmon in its fourth year's growth.

Forlorn Hope. A term applied to a body of officers and men who volunteer, or are detailed, more generally the former, for some important and desperate undertaking in war, the extreme peril of which affords scant hope of safe deliverance, and correspondingly enhances the merit of the service. A contemplated enterprise of great danger and doubtful issue.

Former. A pattern for cartridges. A wad-mold.

Formicas. Chains of small rocks at the water's edge.

Fornax. See CONSTELLATION.

Forrest. French, Captain U.S.N. Born in Maryland in 1796; died in Georgetown, D. C., December 22, 1866. Midshipman, June 9, 1811; lieutenant, March 5, 1817; commander, February 9, 1837; captain, March 30, 1844; dismissed April 19, 1861. He fought bravely in the war of 1812, distinguishing himself in the battle on Lake Erie, and in the action between the "Hornet" and "Peacock," February 24, 1813, and in the Mexican war was adjutant-general of the land and naval forces. When Virginia seceded he was put at the head of the navy of Virginia; commander at the Norfolk Navy-Yard; was afterward commander of the James River squadron, and then Acting Assistant Secretary of the Confederate navy.

Fort-de-France. On the west coast of Martinique, French West Indies. Has a fine harbor, strong fortifications, a naval arsenal, and several hospitals. Pop. 13,300.

Forth. An arm of the sea.

Forty Thieves (*Eng.*). A name given to forty line-of-battle ships commenced in 1815, many of which never got to sea except as *razees.*

Forward. In the fore part. In advance of.

FORWARD-FIRE CARTRIDGE. A metallic cartridge, in which the fulminate is attached to the base of the shot, and fired by a pin running through the powder.

FORWARD GUY. A rope leading from the bowsprit through a block near the end of the lower or swinging-boom, then back through a block on the bowsprit, and in on deck. Any guy leading forward.

Fother. A weight of lead equal to 19½ cwt. Leaden pigs for ballast. To stop a leak by hauling under the bottom a sail closely thrummed with yarns and oakum, the pressure of the water forcing the sail into the aperture.

Foul. Not clear; entangled; jammed. Unclean; filthy. Unfavorable.

FOUL ANCHOR. See ANCHOR.

FOUL BERTH. A berth in which a ship is exposed to the danger of fouling, or of being fouled by, other ships.

FOUL BILL. See BILL OF HEALTH.

FOUL BOTTOM. A term applied to the bottom of a harbor where rocks or wrecks endanger the safety of vessels. The state of a ship's bottom when sea-weed, shells, etc., adhere to it.

FOUL COAST. A coast lined with reefs and breakers.

FOUL FISH. Fish during the spawning season.

FOUL GROUND. See FOUL BOTTOM.

FOUL HAWSE. The state of the hawse when the chains are so intertwined that neither anchor can be picked up without fouling. See HAWSE.

FOUL WEATHER. Wet, windy weather.

FOUL-WEATHER BREEDER. A name given to the Gulf Stream, which occasions great perturbations in the atmosphere. An oppressive state of the atmosphere presaging foul weather.

FOUL-WEATHER FLAG. A flag hoisted as a storm-signal.

FOUL WIND. A head wind; an unfavorable wind.

Founder. To fill with water and sink.

Four-cant. Four-stranded rope.

Fox. Two or more yarns laid up by hand; used for sennit, gaskets, mats, seizings, etc. *A Spanish fox* is a single yarn twisted up in a direction contrary to its original lay; used for small seizings.

Foyst. An old name for a brigantine. Early voyagers applied the name to large barks in India, which were probably *grabs.*

Frame Timbers. The several pieces which compose the frame of a ship, as the floor timbers, first, second, third, and fourth futtocks, and top timbers, which are united, having a proper shift or scarf with each other, and bolted together.

Frames. The timbers spoken of above after being united or bolted together securely. In iron construction it is the floor plate and its angle-irons, as well as the reverse angle-irons united in one rib, which when completed is called a *frame*.

France, Navy of. Although unfortunate in her encounters with the British during the latter part of the last and the commencement of the present century, France has always enjoyed a high reputation for the skill and bravery of her naval officers, and for their services in the cause of science and discovery. The names of D'Estaing, Villeneuve, La Perouse, La Bougainville, La Grasse, and Duquesne, embellish her historical pages, while the possessions which she still retains illustrate their conquests. The fluctuations in the government of the country during the past seven decades have more or less interrupted her progressive arrangements, but the elasticity of her resources and the energy of her people have more than compensated the caprice of events. France had, at the close of 1879, a navy of no fewer than 498 vessels, of 235,162 horse-power, the entire number carrying 2834 guns. This force is divided into 59 ironclads, 264 unarmored screw-steamers, 62 paddle-wheel steamers, and 113 sailing-vessels. The ships are distributed among five maritime divisions, viz., Cherbourg, Brest, L'Orient, Rochefort, and Toulon. But comparatively very few of the ships are equipped for service: they are laid up in ordinary, and can be promptly put into fighting trim, and in the meanwhile no fewer than 50 additional vessels are in course of construction. The navy is manned partly by conscription and partly by voluntary enlistment. None but men above 20 and under 40 years of age are admitted into the service. At the head of the administration of each maritime division there is a vice-admiral, called a *préfet maritime*. There are 19 other vice-admirals in active service, and 13 on a reserved list; 30 rear-admirals, and 21 reserved; 109 captains of first-class men-of-war, and 209 captains of frigates; 648 lieutenants, and 516 ensigns. The engineers are in proportion to the number of vessels actually placed on the service list.

Frank. The fish-eating heron.

Franklin, Sir John. An English navigator and Arctic explorer. Born in Spilsby, Lincolnshire, April, 1786; died June 11, 1847. Entering the navy about 1800, he served with distinction at Trafalgar, and was slightly wounded in the attack on New Orleans, January, 1815. As a lieutenant he commanded the "Trent" in the Arctic expedition of 1818, under Capt. Buchan. In 1819 he led an overland expedition to trace the coast-line of North America, an account of which he published on his return, and was made a captain. In 1825 he renewed this enterprise, tracing the coast from the mouth of the Coppermine River to the 150th meridian, for which service he was knighted. Governor of Van Diemen's Land in 1836–42. In May, 1845, he sailed with the "Erebus" and "Terror" to discover a northwest passage and never returned. Several expeditions were sent in search of him from England and America without success, but Dr. Rae found, in 1854, some relics of the party. In the summer of 1859 Capt. McClintock discovered on the shore of King William's Land a record deposited in a cairn by the survivors of Franklin's company, dated April 25, 1848, stating that Sir John died June 11, 1847; that the ships were abandoned April 22, 1848, when the survivors, 148 in number, started for the Great Fish River. Many relics were found of this party, who perished on their journey, probably soon after leaving their vessels.

Frap. To bind tightly with a rope or piece of small stuff. When a ship is very old and her timbers work, cables may be passed round, serving to hold her together. St. Paul's ship was *undergirded*.

Fredericton, a port of entry and city of New Brunswick, capital of the province of the county of York, is situated on the west side of the river St. John. Lat. 45° 55′ N.; lon. 66° 31′ 30″ W. The public buildings comprise the parliament buildings, the government house, city hall, and barracks. The river, which is here three-fourths of a mile wide, is, however, only navigable for sea-going vessels of 120 tons. Pop. 6150.

Free. To clear; to set at liberty; as, to *free* a boat of water, to *free* a prisoner. The wind is *free* when the ship is not obliged to brace her yards sharp up. *To run free*, to sail with the yards braced in and sheets eased off.

FREEBOOTER. A robber; one who scours the seas for purposes of pillage, a pirate.

FREE PORT. A port where goods may be landed free from custom-house restrictions. A port where goods of all kinds are received at equal rates.

FREE SHIP. A neutral vessel. The doctrine that "free ships make free goods," which means that an enemy's goods, other than such as are contraband of war, found on board a neutral vessel are free from confiscation, has been much discussed and alternately admitted and rejected by most maritime nations. Great Britain has, however, uniformly maintained the opposite doctrine, viz., that enemy's goods found on board a neutral ship may lawfully be seized as prize of war, and the latter proposition has been explicitly incorporated into the jurisprudence of the United States, and declared by the Supreme Court to be founded on the law of nations. This rule, known as the "belligerent rule," is, however, even by those nations which insist on its being the original doctrine of international law, often made to yield to the other and more liberal doctrine by conventions between themselves.

In the days when piracy was more common than it is now, piratical craft were often called *free ships*.

FREE TRADER (*Eng.*). A ship formerly trading to India independently of the East India Company. A prostitute.

French Fake. A fake or coil of rope where the turns dip one under the other, so as not to foul in running.

French Lake. The Mediterranean Sea.

French Leave. Absence without permission. *To take French leave*, or *to French*, is to leave without permission.

Frenchman, or Frenchy. A sailor's name for any foreigner, particularly of the Latin race.

French Sennit. Sennit in which an odd number of nettles are regularly and evenly woven one under and then over the others in succession. See SENNIT.

French Shroud-knot. A shroud-knot in which the three strands of one end are walled over those of the opposite end.

French the Ballast. To freshen the ballast.

Fresh. New; not impaired by use nor time. Slightly intoxicated. Impudent; cheeky. Not salty. Overflow of running water. The current of a river in the sea beyond its mouth. *Fresh breeze,* a breeze blowing from 13 to 15 miles per hour, in which royals may be carried; indicated by 5 in the Beaufort scale. *Fresh topgallant breeze,* a breeze blowing from 15 to 17 miles per hour, in which topgallant-sails may be carried; indicated by 6 in the Beaufort scale. *Fresh wind,* a wind blowing from 17 to 18 miles per hour, in which topgallant-sails are taken in and topsails reefed down; indicated by 7 in the Beaufort scale.

FRESHEN. To renew. *To freshen the hawse,* to veer out a little more cable to bring the chafe and strain on another part. *To freshen the ballast,* to shift or restow it. *To freshen the way,* to increase the speed of the ship. *To freshen the nip,* to veer on the cable or pull upon a backstay to shift the chafe from a particular spot; also, to take a drink, especially just after the sun dips; this was accompanied by the toast "downfall of the barbarous Moors."

FRESHES. Swollen ebb-tides due to heavy rains.

FRESHET. A current or stream swollen by heavy rains or melting snow.

FRESH GRUB. Provisions not salted.

FRESH HAND. A greenhorn; a new hand. When a gale increases the sailors say there is a *fresh hand at the bellows.*

FRESH WATER. Water fit to drink, in opposition to salt water. In early days ships were obliged to carry immense quantities of fresh water, but of late it has been obtained by distillation of salt water. See DISTILLER.

FRESH-WATER SAILOR. One who is not accustomed to the sea, his experience having been confined to lakes and rivers.

FRESH-WATER SEAS. The Great Lakes.

FRESH WAY. Increased speed. *To gather fresh way,* to recover speed after being stopped or checked.

Fret. A narrow strait of the sea—from *fretum.* To chafe. *A fret of wind,* a light flaw.

Friar-skate. The sharp-nosed ray (*Raia oxyrinchus*).

Friction. A force which acts between two bodies at their surface of contact, and in the direction of a tangent to that surface, so as to resist their sliding on each other, and which depends on the force with which the bodies are pressed together.

There is also a kind of resistance to the sliding of two bodies upon each other, which is independent of the force by which they are pressed together, and which is analogous to that kind of strength which resists the division of a solid body by *shearing,*—that is, by sliding one part over another. This kind of resistance is called *adhesion.*

Friction may act either as a means of giving stability to structures, as a means of transmitting motion in machines, or as a cause of loss of power in machines.

FRICTION-BAND, or STRAP. A flexible band used as a brake to resist the rotary motion of a wheel, shaft, or pulley. It is firmly secured to a rigid part of a machine or structure, and is made to clasp or release a revolving part at will by means of screws or levers. It is applied on steamships to check the revolving motion of the screw-propeller when the vessel is under sail headway, and it is desired to "couple" the engines with the screw for the purpose of using steam-power.

FRICTION-BAR. A bar on the slide of an iron gun-carriage that is made by friction to absorb the recoil.

FRICTION-PRIMER, or FRICTION-TUBE. A primer used to inflame the charge of a gun. It consists of a metal tube filled with fine-grained powder, having at its upper end a short tube at right angles, in which is a notched iron wire, imbedded in fulminating composition. A loop in this notched wire receives the laniard, and its friction ignites the fulminate.

FRICTION-RAIL. An iron rail on an iron gun-carriage, that by pressing against the friction-bar absorbs the recoil.

FRICTION-ROLLERS. Rollers of hard wood or metal placed in a metal bushing about the axis of a sheave or truck to aid in reducing the friction.

FRICTION-TRANSOM. The transom of a gun-slide to which the friction-bars are attached.

Friday. An unlucky day in the seaman's calendar. By old sailors it was, and is, considered imprudent to commence any undertaking on Friday.

The superstition extends to India, among the Brahmins. Friday's moon was an unlucky one in England.

Probably it owes much of its unlucky character in the sailor's mind to its being a *jour maigre,* a banian-day, or one on which no meat was allowed to the crew; hence, a black-letter day in the seaman's calendar. Fish brought in on Friday were likely to decay, as they would not be sold before the following week; hence the fisherman's superstition. Good-Friday is called in German *charfreitag,* mournful Friday, and here its unlucky character would seem to originate.

Friezing. The ornamental carving or painting above the drift-rails and around the bow and stern.

Frigate. A familiar name for the Portuguese man-of-war, *Physalis pelagica.*

Frigate. The name was anciently written in English *friggot* and *frigat,* meaning, according to Webster, an open ship or vessel; this authority also says it is probably derived from the Latin *fabricata,* something constructed or built.

In Portuguese it signifies a boat as well as a ship. The word as generally used at the present time signifies a ship of war with two decks for guns, and mounting from 20 to 60 guns. In 1799, "The British Naval Chronicle" says, "Frigates mount from 20 to 40 guns, and some taken from the French mount 46."

The author of the *Dictionnaire de la Marina,* published in Amsterdam in 1739, is the only writer that treats of the frigate. He says the word derives its origin from the Mediterranean, where it was used to designate long vessels that

used both sails and oars, and carried a deck of which the topside, being higher than that of galleys in general, had openings resembling port-holes for the passage of oars. What occasioned this name for swift sailing and pulling galleys is not known. The same name was applied by the French to a very swift-flying sea-gull. It is easy to conceive that France, bordering upon the Mediterranean, should, ere long, have launched similar vessels from her channel-washed shores, adapting them, by a bluffing body and larger size, to encounter the storms and swells of a northern sea.

Towards the middle of the 16th century English merchant ships were generally called "frigates," as are the Spanish merchant ships of the present time, "*da guerra*" being added to distinguish a ship or frigate of war. Towards the close of the 16th century some of these merchant-frigates were hired to serve in the navy. In 1588, we find among the ships serving with Sir Francis Drake the "Friggat Elizabeth Fonnes, of eighty tons and fifty men," about the size of a small fishing-schooner, and not so large by one hundred tons as modern yachts such as the "America" and "Henrietta." The "Elizabeth Fonnes" was one of the English ships fitted out to oppose the far-famed and self-styled "Invincible Armada."

Sir Robert Dudley, Duke of Northumberland, prepared drafts of seven distinct classes of ships of war, among which was one 160 feet in length, and having 24 feet beam, constructed to carry a tier of guns on a single whole deck, beside other guns on two short decks, resembling the quarter-deck and forecastle, or, rather, not being united by gangways, the poop and topgallant forecastles of modern ships. The disposition of the guns on board this vessel was precisely the same as in the modern single-banked frigate, and Sir Robert called his ship thus constructed and armed "frigata."

The first English navy list on which the name occurs was published in 1604, and contains only a "French Frigat." She is placed on that list the last but one, and could have been but little more than a boat, her burden being only 15 tons.

The next English navy list that bears the name is that of 1633, on which we find registered "Swann Frigat" and "Nicodemus Frigat," each of 60 tons, 10 men, and 3 guns. These were probably pleasure-yachts, built to attend Charles I. on his frequent visits of inspection to his different naval depots.

Fuller, writing about the year 1660, says: "We fetched the first model and pattern of our friggots from the Dunkirks, when in the days of the Duke of Buckingham, then admiral, we took some friggots from them, two of which still survive in His Majesty's navy by the names of the 'Providence' and 'Expedition.'" The duke, then Marquis of Buckingham, was the lord high admiral from 1619 to 1636, and the names of these two vessels occur in the lists of 1632 and of 1652. They seem to have been small ships, mounting from 20 to 30 guns, chiefly on a single deck.

Mr. Pepys, the historian, who, from his position in the Admiralty, may be considered good authority, says that the first frigate built in England was the "Constant Warwick," built by Mr. Peter Pett, the elder, at Ratcliffe in 1646 as a privateer for the Earl of Warwick, and afterwards sold by him to the Commonwealth. This Peter Pett was also the constructor of the first English three-decker, "The Sovereign of the Seas," but he had it recorded on his tombstone, evidently esteeming it the greatest honor, that he was the "*inventor* of the first frigate."

His son confessed to Pepys that his father took his model of a frigate from a French frigate which he had seen in the Thames. Probably the Frenchman was a privateer, and quite likely one of the many which the enterprising Dunkirkers had equipped.

Fuller and Pepys both refer to a model or pattern showing some distinguishing peculiarity between a frigate and the ordinary ships of war, yet neither give the faintest description of what the peculiarity was, whether in form, armament, rig, or all three united.

The dates of the transfer of this "frigate" to the navy by the Earl of Warwick is unknown; but her first appearance on any list as a national vessel was in 1652, when she is classed as a *fifth-rate* of 28 guns; in another list of the same year her guns are stated at 32. When a privateer she mounted but 26. In 1677 she appears on the list as a *fourth-rate*, mounting 42 guns. The "Constant Warwick's" length of keel was 90 feet, her breadth of beam 28 feet 2 inches, depth of hold 12 feet, draft of water 12 feet 8 inches, and her tonnage, modern measurement, 380 to 400 tons.

Her armament consisted at first of 18 light demi-culverins, or short 9-pounders, on the main deck; two minions, or 4-pounders, on the roof of the officers' cabin, or poop, and six light sackers, or short 6-pounders, on what may be called the quarter-deck. The main, or gun-deck of this frigate, as in modern vessels of this class, had originally a continuous tier of guns, nine of a side, to which subsequently one was added for each bow port, before unprovided, making 20 in all; on her second, or spar-deck, the bulwarks, or barricades, only extended, in the first instance, to the gangway or mainmast; behind them were mounted the six sackers, or 6-pounders. These bulwarks were afterwards extended forward, and thus gave room for a second whole tier of guns, which, with the minions on the poop, extended forward to the side of the quarter-deck, and mounting six 4-pounders instead of two, as formerly, converted her into the 46-gun ship she was represented.

She was disposed of by the earl, after having shown decided proofs of superior sailing over all other classes of vessels; nevertheless, we may credit a writer who, in 1665, complains of the ships of the British navy being "*over-gunned*," and instances "The Constant Warwick from twenty-six gunns and an incomparable sayler to forty-six gunns and a slugg." Retaining her original appellation, we see that from a properly armed, snug one-decked vessel, the "Constant Warwick" was converted into an over-gunned, top-heavy, two-decked ship, the only good quality remaining to her being the original sharpness of her lower body, or what a modern naval architect would call the fineness of her lines. This sharpness of form appears to be the only characteristic of the frigate which English builders thought worthy of being retained, and seemed to them a property suited to all sizes and classes of ships. Accordingly, we find, between the

years 1646 and 1653, upwards of 60 "frigates" were built or building, and one of the latter designed to mount from 50 to 80 guns, while the others are variously classed from 56 down to 12 guns. The name at that time seems to have been general to all but ships of the first class. The natural effect of this sharpness applied to an overloaded ship of 60 or 70 guns was to immerse her so deep in the water that her lower battery was sunk too low and too near the water-line to be useful.

According to Mr. Pepys, "In 1663 and 1664, the Dutch and French built ships of two decks, which carried from 60 to 70 guns, and were so contrived that they carried their lower deck guns four feet from the water, and to stow four months' provision; whereas our frigates from the Dunkirk build, which were narrower and sharper, carried their guns but little more than three feet from the water, and but ten weeks' provision." Mr. Pepys then states that five frigates, viz., three of 70, one of 66, and one of 64 guns, were ordered to be built of such dimensions as to obviate those defects. Eight or ten years later Mr. Pepys, still complaining of the want of buoyancy of the British frigate, says: "In 1672 and 1673 the French brought a squadron of 35 ships to join our fleet at Spithead. There were several excellent ships with two decks and a half that carried from 60 to 70 guns, more especially one called the 'Superbe,' which his Majesty and Royal Highness went on board of. She was 40 feet broad, carried 74 guns, and six months' provisions. Our frigates being narrow could not stow as much provision, nor carry their guns so far from the water, which, Sir Anthony Deane observing, measured the ship, and gave his Majesty an account thereof, who was pleased to command Sir Anthony to build the 'Harwich' as near as could be of the 'Superbe's' model and dimensions, which was done accordingly with such general satisfaction as to be the pattern of the second- and third-rates built by the late act of Parliament."

Thus in less than twenty years the first frigate spread her name, if not her qualifications, over nearly the whole of the British navy.

From 1677, the date when first- and second-rates excluded two-decked ships, the name "frigate" was confined to the third and three inferior rates. Towards the close of the 17th century the first *four* rates of the British navy assumed the name of *line-of-battle ships*, or *ships of the line*, and the frigate was restricted to the fifth- and sixth-rates.

When first arranged the ships of the line comprised all vessels of over 50 guns, and frigates those from under 50 to 20 guns. In 1727 frigates were of three classes, viz., 40, 30, and 20 guns, measuring 600, 420, and 374 tons respectively, and mounting 12-, 9-, and 6-pounders. Two new classes were added in 1740. The one a 44-gun ship, of about 710 tons, with 40 guns upon two decks, with batteries of 18- and 9-pounders instead of 12's and 6's, also with four 6-pounders additional on the quarter-deck. The other was a 24-gun ship, of 440 tons, with twenty 9-pounders on the main, or gun-deck, two 9-pounders on the spar-deck, and two 3-pounders on the quarter-deck. Within the nine years next succeeding thirty-eight of the 44's were built, and several of the old 40's made to carry four 6-pounders on the quarter-deck, and thus, in 1755, the old class of 40's became extinct. In 1748 a 28-gun ship, of 585 tons, and carrying twenty-four 9-pounders on her main and four 3-pounders on her quarter-deck, was constructed, and proved a decided improvement on the old 24, as well as the 30-gun class. This 28 is the first ship which in the arrangement of her guns conveys any idea of a modern frigate.

In 1757 two new classes—a 32 and the other a 36—were added. On the 29th of March, 1756, the navy board agreed with Robert Inwood to build a fifth-rate ship, on a plan proposed by Sir Thomas Slade, a surveyor of the navy. This ship was to measure 671 tons, and to mount twenty-six 12-pounders on the main, four 6-pounders on the quarter-deck, and two 6-pounders on the forecastle. She was launched May 5, 1757, and was called the "Southampton,"—a name still retained in the English navy. Another like her, and named "Diana," was launched in August, and others followed. The "Alarm," on which copper sheathing was first tried, in 1761, was of this class. Much smaller ships, however, continued to retain the designation of frigates, for between 1757 and 1760 four ships were built for the English navy and four captured by it, which averaged only 312 tons, and mounted from 14 to 18 guns, and these, in the record of 1760 and of 1762, are styled frigates. They were soon after stripped of that name, and called "sloops," or "sloops-of-war."

The "Southampton" must be considered as the first genuine frigate of English build,—that is, she was the first English ship constructed to carry her guns on a single whole deck, a quarter-deck, and a forecastle, the unvarying characteristic of the sailing-frigate of our later times. The "Southampton" bore the character of a good sea-boat and prime sailer, and after a successful career of fifty-six years was wrecked on a reef in the Crooked Island Passage.

The 36-gun frigate of this date averaged 720 tons, and was armed with four additional 6-pounders on the quarter-deck. Three of this class and rate only were built, viz., the "Pallas," launched in 1757, and the "Brilliant" and "Venus." In 1774 some newly-discovered virtues in the old 44-gun ship caused twenty-nine of them to be built. Like their predecessors, they proved crank, and carried their guns too low, and, after several endeavors to improve them, they were deprived of their guns on the lower deck and, being fitted with poops, converted into store-ships.

The first Admiralty order establishing the 38-gun frigate is dated September 30, 1779, and marks their first appearance as a British class. Previous to 1782 five had been launched, averaging 946 tons. These ships were named "Arethusa," "Latona," "Minerva," "Phaeton," and "Thetis." The "Minerva," the first afloat, was launched at Woolwich, June 8, 1780. These ships mounted twenty-eight 18-pounders on the main deck and eight 9-pounders on the quarter-deck and forecastle, throwing 300 pounds of metal at a broadside.

Carronades were invented the year these vessels were ordered by the Admiralty, and eight 18-pound carronades and fourteen swivels, in addition to their original armament, were placed on board them, converting them in reality into 46-

gun ships. The swivels were disposed of when the two forecastle guns were reduced from 12- to 9-pounders. In 1781 there were 604 carronades in the royal navy, of sizes from 32-pounders to 12-pounders. With the advance in ordnance and marine architecture the frigates of the Old World increased in size and military value; but they continued to be used, as originally intended, as the "scouts," so to speak, of the main body of a sea army. Nelson called them the "eyes of the fleet."

On July 10, 1797, was launched at Philadelphia the "United States," frigate, the first of those American "forty-fours" which were destined to become so celebrated in the annals of naval warfare. They were longer proportionally, had heavier scantling, and carried heavier batteries than any ships of equal rating in the world. They were spoken of in England as "74's in disguise." Their appearance on the ocean effected a marked change in the designing and arming of ships of war of foreign navies. "It is but justice in regard to America," writes an eminent English authority, "to mention that England has benefited by her example, and that the large class of frigates now (1840) employed in the British service are modeled after those of the United States."

Passing over the periods marked by the appearance of the "Fulton," "Missouri," and "Princeton," we may come at once to the "Minnesota" class of steam-frigates, launched in 1855. These magnificent specimens of naval architecture, with their enormous batteries, were in their day the wonder and admiration of the entire maritime world.

A clever writer on English naval affairs says, "It was not until comparatively recent times that the navies of different powers began seriously to vie with each other in the introduction of the very destructive ordnance now in use, the largest known specimens of which are to be seen on board the new American frigates" (the "Minnesota" class).

The "forty-four" of 1812 carried a battery of thirty 24-pounders on the gun-deck, fourteen 32-pounder carronades on the quarter-deck, and six 32-pounder carronades on the forecastle; making a total of fifty guns, throwing 1360 pounds of solid shot, or 680 pounds at a broadside. She had a complement of 430 men, and cost, to build, $220,910. The "Minnesota's" battery in time of war consisted of twenty-eight 9-inch shell guns on her gun-deck, twenty 9-inch guns on the spar-deck, and two 11-inch pivot-guns mounted on the forecastle and quarter-deck, respectively. This gave a total of fifty guns, throwing 3799 pounds of loaded shell, or 4320 pounds of solid shot; or a broadside of 2035 pounds of shell, or 2492 pounds of solid shot. Her displacement is 4700 tons. The "Ohio," a fair representative of the line-of-battle ships, has a displacement of 4250 tons, and threw at a broadside 1612 pounds of solid shot. By comparing these figures and considering the increased mobility due to steam-power, an idea may be formed of the relative military value of the frigate of the steam period and the line-of-battle ship of the last of the sail period.

The estimated cost of a line-of-battle ship in 1812 was $333,000. The cost of a modern frigate may be seen from the following table:

	Cost of Hull.	Machinery.	Total.
Colorado	$828,143	$170,000	$998,143
Merrimac	707,062	172,064	879,126
Minnesota	694,711	154,982	849,693
Niagara	858,904	234,361	1,093,265
Roanoke	644,215	170,000	894,215
Wabash	813,644	165,924	979,568

From this comparison it will be seen how completely the term frigate has ceased to convey any idea of the military value of a vessel of war.

A *frigate-built* ship is one having the decks arranged like those of the earlier frigates, *i.e.*,—with a raised quarter-deck and forecastle. From these there was a descent of a few steps to the *waist*. Her forecastle extended from the stem to the *belfry;* the quarter-deck from the stern to the gangway. The open space between was the *waist;* hence the term a "deep-waisted ship."

FRIGATE-BIRD. A large and rapacious tropical fowl of the genus *Tachypetes* (*T. aquila*), with very long wings; allied to the pelican.

FRIGATOON. A Venetian vessel built with a square stern, with a mainmast, jigger-mast, and bowsprit. The name is also applied to a ship-rigged sloop-of-war.

Frigid Zone. See ZONES.

Fringing-reefs. Narrow reefs of coral formation at short distances from the shore.

Frisk. To freshen, as the wind.

Frith. Derived from *fretum maris*, a narrow strait: an arm of the sea into which a river flows. Synonymous with *firth* (which see).

Fritters. Tendinous fibres of the whale's blubber, running in various directions, and connecting the cellular substance which contains the oil. They are what remains after the oil has been *tried* out, and are used as fuel to *try* out the next whale.

Frobisher, Sir Martin. This distinguished naval adventurer of the Elizabethan period, the first Englishman who sought to discover a northwest passage to China, was a native of Doncaster, but the year of his birth is unknown. After endeavoring in vain for many years to secure money and vessels to search for the northwest passage, he was patronized by several persons of rank and fortune, and succeeded in securing money enough to fit out two small vessels of 25 tons each, and a pinnace of 10 tons. With these he sailed from Deptford, June 8, 1576. On the 11th of August he entered the strait which bears his name. The second expedition under his command sailed in May, 1577, and the third in the following year. He afterwards served under Drake in the West Indies, and was knighted for distinguished bravery in the fight with the Spanish Armada, July 26, 1588. He died November 7, 1594, the result of a wound received while leading an attack by sea against Brest.

Frog. An old term for a seaman's coat or frock. A leather pocket or case for a pistol, bayonet, or cutlass. An amphibious animal of the genus *Rana*.

FROG-EATERS. Frenchmen.

FROG-FISH. See FISHING-FROG.

FROG-LANDERS. Hollanders.

FROG-PIKE. The female pike, spawning at the same time as frogs.

Frontage. The length or face of a wharf.

Frost. The congelation of the vapor of the atmosphere. The *hoar* frost, or *white* frost, which is seen in the mornings during spring and autumn, is merely frozen dew. See DEW.

FROSTED. Having a lustreless appearance, as metals, glass, etc., when not polished; this appearance somewhat resembles hoar-frost; hence the name. *Frosted* work is introduced as a foil or contrast to *burnished* work, in which the metal is highly polished.

FROST-FISH. A small fish, called also *tom-cod;* they are taken in large quantities in the depth of winter by fishing through holes cut in the ice.

FROST-RIME. See FROST-SMOKE.

FROST-SMOKE. A thick mist in high latitudes, arising from the surface of the sea when exposed to a temperature much below freezing; the vapors as they rise are condensed either into a thick fog, or, with the thermometer about zero, hug the water in eddying white wreaths. The latter beautiful form is called a *barber*, probably from its resemblance to soap-suds.

Froth. See FOAM.

Frumentariæ. The ancient vessels which supplied the Roman markets with corn.

Frush. A term for wood that is apt to splinter and break.

Fry. Young fishes.

Fucus Maximus. An enormous sea-weed, growing abundantly round the coasts of Tristan d'Acunha, and perhaps the most exuberant of the vegetable tribe. Said to rise from a depth of many fathoms, and to spread over a surface of several hundred feet.

Fuddled. Not quite drunk, but unfit for duty. Confused.

Fuel. Any substance used to produce heat by combustion, as coal, wood, peat, oil, etc. Carbon and hydrogen are the elements of heat in fuel.

Fuell. An old nautical word signifying an opening between two headlands.

Fu-fu. A sea-dish of barley and molasses.

Full. Complete; plump; filled out. Sails are *full* when the wind inflates them, so as to give the ship headway. The yards are said to be braced *full* when the sails are filled. *Keep her full!* an order to the helmsman to keep the sails full, and not allow them to shake.

FULL AND BY. Sailing close to the wind with yards sharp up and sails full.

FULL-BOTTOMED. Of great capacity below the water-line.

FULL DRIVE. Forcibly; with great vigor.

FULL DUE. For good; final.

FULL FEATHER. In full dress; attired in best clothes.

FULL FIG. See FULL FEATHER.

FULL MAN (*Eng.*). A rating in coasters for one receiving whole pay as being competent to perform all his duties; able seaman.

FULL MOON. When the moon is in opposition the whole illuminated disk is turned toward the earth; the moon is then said to be *full.*

FULL PAY. The pay allowed when on actual service.

FULL SEA. High water.

FULL SPEED. Highest speed.

FULL SPREAD. All sail set.

FULL SWING. Complete control.

Fulmar. A web-footed sea-bird, *Procellaria glacialis*, of the petrel kind, larger than the common gull; its eggs are taken in great quantity at St. Kilda and in the Shetlands.

Fulminates. The salts of fulminic acid. See EXPLOSIVES.

Fumado. A commercial name of the pilchard, when garbaged, salted, smoked, pressed, and packed.

Fumble-fisted. Awkward in catching a turn, or otherwise handling a rope.

Fumigate. To purify confined or infectious air by means of smoke, sulphuric acid, vinegar, and other correctives. See DISINFECTANTS.

Funeral Honors. On the receipt of official intelligence of the death of the President of the United States, the senior officer present, on the following day, causes the ensign of each vessel under his authority to be hoisted at half-mast from sunrise to sunset, and a gun to be fired by his vessel every half-hour, beginning at sunrise and ending at sunset. At naval stations the same ceremonies are observed.

On the death of a commander of a fleet, squadron, or division, at sea, the ensigns of all the vessels present, and the distinguishing flag of command which he wore, are hoisted at half-mast during the performance of the funeral ceremony; and on committing the body to the deep, the flag-ship fires as many minute-guns as he was entitled to receive for a salute when alive, and his flag is hauled down on firing the last gun. If occurring in port, the ensigns and distinguishing flag mentioned are hoisted at half-mast during each day from that of his decease until sunset of the one on which the funeral service is performed, and, on sending the body to the shore, the prescribed number of minute-guns is fired. The escort fires three volleys of musketry over the grave.

On the death of an officer commanding a vessel, at sea, the ensigns of all the vessels present, and the pennant of the vessel he commanded, are hoisted at half-mast during the performance of the funeral ceremony; and, on committing the body to the deep, the vessel he commanded fires as many minute-guns as he was entitled to receive as a return salute when alive. If in port, the pennant of the vessel he commanded is hoisted at half-mast during each day from that of his decease until sunset of the one on which the funeral service is performed; and, on sending the body to the shore, all the vessels present half-mast their ensigns until sunset, and the number of minute-guns indicated is fired. The escort fires three volleys of musketry over the grave.

On the death of a commissioned officer, other than those already mentioned, at sea, the ensigns of all the vessels present are hoisted at half-mast during the performance of the funeral service; and if in port, the ensigns are so hoisted during the time that the body is being conveyed to the shore, and until the return of the funeral escort to the ship. In either case, after the funeral services, three volleys of musketry are fired by the full marine guard.

On the death of an officer of the staff corps, the same funeral honors are observed as those prescribed for a line-officer of the same relative rank, except that the distinctive flag or pennant of the vessel is not hoisted at half-mast, and that no minute-guns are fired.

On the death of a warrant-officer, the ensigns of all the vessels present are hoisted at half-mast during the performance of the funeral service when at sea; and when in port, during the time that the body is being conveyed to the shore, and for one hour afterward. In either case, three volleys of musketry are fired by a sergeant's guard of fourteen men.

On the death of a petty officer, or other person of inferior rating, the ensigns of all vessels present are hoisted at half-mast during the performance of the funeral service when at sea; and when in port, during the time that the body is being conveyed to the shore.

On the death of an officer, non-commissioned officer, or private of the marine corps, the funeral honors are to be regulated by his relative rank.

If it should not be practicable to fire with musketry at the grave of any officer in a foreign country, the volleys are fired over the body after it is lowered into the boat alongside the ship.

Funeral honors are not to be paid before the rising nor after the setting of the sun.

Fungus. See Dry Rot.

Funk. To become frightened; to show the white feather. To blow tobacco smoke in a person's face.

Funnel. A metal tube for carrying off smoke from a furnace. The galley-funnel is familiarly known as Charley Noble.

Funny. A light clinker-built pleasure-boat, rowing a pair of sculls. It is long and narrow, and used for racing.

Fur. Scale formed in a boiler. To clean off the scale from the interior of a boiler.

Furl. To roll up and bind a sail to its yard or boom.

Furling-line. A small line for binding a sail to its gaff or boom when furled. A sea-gasket.

Furlough. The correct definition of the word *furlough* as used by the Navy Department is leave or license given by the Secretary of the Navy to an officer to be unemployed for a specified time. This is done upon request of the officer, and sometimes by decision of the Department, as in cases of officers who get duty on board vessels carrying U. S. mail. Furlough under such circumstances is not a punishment. Where an officer is put on furlough by the Secretary of the Navy as a penalty, or in the sense of implying censure, the word is used in the past tense, viz., *furloughed*. It so appears at least in the Navy Register.

Officers on *furlough* and officers *furloughed* receive one-half of the pay to which they would have been entitled if on leave of absence on the active list. (Rev. Stat., Sec. 1557.)

The Secretary of the Navy has a legal right to furlough any officer on the active list. (Rev. Stat., Sec. 1442.)

Furnace. A structure in which intense heat is produced by combustion and applied to such purposes as the manufacture and working of metals, generation of steam, etc. The general peculiarities of furnaces are designated by specific names, such as blast-furnace, reverberatory-furnace, steam-boiler furnace, etc.

Furnace-bridge. See Fire-bridge.

Furnace-door. A door for closing the mouth of a furnace.

Furniture. The rigging, sails, spars, anchors, cables, boats, provisions, etc., which make up a vessel's equipment.

Furole. The luminous appearance known as the *corpo santo*. See St. Elmo's Fire.

Furube. A fish taken on the coast of Japan, and considered to be poisonous.

Furze. Brushwood prepared for breaming.

Fuse. See Fuze.

Fusible Alloy. An alloy composed principally of tin, lead, and bismuth, which will melt near or below the temperature of boiling water. When the component parts are tin 19, lead 31, and bismuth 50, the alloy will melt at a little less than 212° F.

Fusible Plug. A plug of easily fusible metal or alloy screwed into a crown-sheet or other suitable part of a boiler-furnace, which, by melting when not covered by water, gives warning of low water and partially releases the pressure from the boiler. The device has never proved successful, and is not now in use.

Fust. A low but capacious armed vessel, propelled with sails and oars, which formerly attended upon galleys; a *scampavia*, barge, or pinnace.

Fustick. In commerce, a dye-wood brought principally from the West Indies and Spanish Main.

Futtocks. The crooked timbers placed in the lower parts of the frames of a wooden ship, commencing with the heads of the floor timbers, and as they go upwards are called first, second, third, and fourth futtocks until the top timbers are reached. The term *hook* is frequently applied to anything bent or curved, as boat-hooks, fore-hooks, after-hooks, etc. *Futtock* is a corruption of *foot-hook*, and is so named from its being placed at the foot of a timber.

Futtock-band. An iron band around the lower mast, to which the futtock-shrouds are secured.

Futtock-holes. Holes in the top-rim for the futtock-plates.

Futtock-plates. Certain iron plates having their upper parts open like a ring, to fix the dead-eyes in; and round holes are punched at the lower end of these plates for the futtock-shrouds to hook into.

Futtock-riders. These are used in merchant ships built of wood. They are placed on an angle of 40°, more or less, with the stem and stern-post, and are secured at the lower end to a hook which crosses the stem and at the upper end to the diagonal knee, towards which the rider is pointed; they are generally placed inside of the ceiling.

Futtock-shrouds. Lengths of iron chain connected with the futtock-band and the futtock-plates, and serving to take the strain of the topmast rigging. In large ships they are sometimes rattled down for convenience in getting into the tops.

Futtock-staff. A leather-covered iron rod inside the topmast rigging for the topgallant shrouds to lead over.

Fuze. The local apparatus for inflaming the charge of a shell or torpedo.

The fuzes for shells are classified as time-, percussion-, and concussion-fuzes, according to their mode of operation.

The time-fuzes used in the navy are:

1. Navy metal stock time-fuze, for S. B. spherical and for M. L. R. shell.
2 Bormann fuze.
3. Time-fuze, wooden stock, for B. L. howitzers.
4. The bomb or mortar fuze.
5. Rear fuzes, in base of rifle-shell.

The navy time-fuze is fitted to all spherical shell (except the 24-pounder and 12-pounder boat-howitzer ammunition) and to a part of the expanding shell for rifle guns. This fuze consists of a column of inflammable composition driven in a paper case, intended to burn a certain number of seconds, having a safety-plug attached to its lower orifice in such a way as to prevent the issue of flame so long as it remains fixed, and also to guard the composition against the effects of moisture.

In practice, this plug, which consists of a short solid cylinder of lead, is detached from its position upon the firing of the gun, the jar caused by the explosion being sufficient, thus leaving the fuze-composition in contact with the shell charge. The safety-plug is omitted in time-fuzes intended for use in rifle-shell.

The paper case in which the composition is driven is made slightly tapering to fit into the metal stock, the safety-plug attached to the lower end projecting through the stock about half an inch.

The composition is covered on top by a water-cap, of peculiar construction, being primed on its outer surface with a strand of quick-match and powder; its object is to protect the flame from being extinguished on ricochet; this is next covered by a thin piece of parchment, and over all by a leaden patch, which is firmly fixed by being expanded to fill the recess in the metal stock; it is provided with a lug, that it may be stripped off to expose the priming, otherwise the fuze will not ignite, and consequently the shell will not explode. The length of fuze, in seconds, is stamped upon the leaden patch, and outside of all, printed upon paper, is pasted the date of manufacture, length of fuze, with initials of inspecting officer.

These fuzes are of 3½, 5, 7, 10, 15, and 20 seconds time of burning, a certain proportion of each being supplied to each ship, although all shell, unless otherwise ordered, are fitted and issued from the shell-houses with the 5-second fuze, which is regarded as the general working fuze. For greater or less distances this fuze may be drawn, and any of the others substituted. The navy time-fuze is rarely extinguished by several ricochets on water; and near the end of its flight, when fired direct, frequently acts by concussion. The fuze used should not be of longer time of burning than requisite to reach the object; the shorter times are of quicker composition, therefore more certain; also on firing on ricochet the shell may sink short of the distance necessary for its explosion, and consequently be supposed to fail.

For special firing, as, for example, at shore batteries or masses of uncovered troops, any of these fuzes may be shortened. To do this, unscrew the water-cap and back the paper case out from the lower end with a drift and mallet; cut off from the lower end with a fine saw, or sharp knife struck with a mallet, the proportional part required, and insert the upper part in the stock, forcing it down with a few gentle blows with the drift; screw on the water-cap. But this operation should only be performed by an expert, and in cases of necessity: as when done by inexperienced persons, premature explosions have been caused, seriously damaging the guns. It is preferable, therefore, when circumstances will admit, to take up such distance as will correspond with the time of flight of one of the regulation lengths. When firing against ships or earth-works, the fuze should be a little longer than necessary, in order to reach the object before bursting; but a little shorter when firing against boats or masses of troops, in order to insure its bursting in front of them.

Time-fuzes are generally very unreliable in rifle guns, as expanding or forced projectiles cut off the flame from the fuze; but with the Parrot shell, the navy time-fuze is comparatively certain of ignition and regular in its time of burning. The safety-plug must be removed when the navy time-fuze is used in rifled cannon, as recent experiments show that it is a probable cause of premature explosion of shells. In testing the navy time-fuze by the watch or michrometer, the safety-plug must be removed; otherwise the fuze will burn longer than the time for which it is marked, as all navy time-fuzes, being intended for use under a water-cap, burn a longer time in the open air.

The Bormann fuze is fitted to all S. B. shrapnel and the 24-pounder and 12-pounder boat-howitzer ammunition, and has been fitted to certain shell for special firing; the length of the fuze being the limit of distance within which this fire is effective. It consists of a short cylindrical case of soft metal (composition of lead and tin), containing an annular space charged with fuze-composition of a uniform density and thickness throughout. The annular space or indentation for the composition is made on the lower side, in the shape of a horseshoe, one end of which connects with a small magazine in the centre of the fuze. This indentation extends nearly through the cylinder, that portion of the metal left on top being quite thin. The fuze is charged from the under side, a strand of quick-match being first placed in the bottom of the channel; the fuze-composition is then laid in a smooth layer throughout, and a ring of the same metal as the case is pressed upon it by machinery, sealing it hermetically. The cylindrical opening or magazine in the centre is filled with fine powder and covered with a cap of sheet-lead; with those supplied at present this cap is made quite thin, obviating the perforation heretofore necessary.

The metal on the upper surface of the fuze over the composition is graduated in equal parts and marked in seconds and quarter seconds, and being quite thin is easily cut with a gouge, thus exposing the fuze-composition to the flames. Care should be taken in making the cut not to pierce the priming-chamber or magazine, which would necessarily cause an explosion at the muzzle of the gun.

On the side of the fuze the thread of a screw is cut, by which means it is fitted to the projectile; and to prevent its being driven into the shell by the explosive force of the charge, the fuze being made of soft metal, it is supported by a composition plate, which is first screwed into the fuze-hole, having a perforation in its centre

for the flame to pass through. No oil is to be used on the threads of this fuze, and on screwing it in it must be started fair, so as to be evenly supported on the plate.

The date of manufacture and initials of inspecting officer are stamped on the upper surface of the fuze, and on the bottom is pasted a piece of paper on which is noted the date when inserted in projectile.

This fuze is opened at the required number of seconds by cutting close to the right of the mark on the index plate. The cut should be made down to the plane of the table, in order to expose the composition; and is best made by two or three efforts, instead of trying to effect the cut at once. This fuze should be carefully explained to the men, as shells have been taken from guns with the cut actually made into the priming-magazine.

The time-fuze for B. L. howitzer, which is virtually a modification of the English Boxer fuze, consists of a beech-wood stock, conical in form, fitted to receive the paper-case fuze, which is somewhat less in diameter than the regulation navy time-fuze already described. Just above the upper face of the fuze-composition is an unoccupied space from which four gas-vent channels lead to the outside of the stock above the point of the shell. Immediately above this gas-vent chamber the bore of the stock is considerably enlarged to receive the igniter. This consists of a small bronze hollow cylinder, closed at the lower end, where it is furnished on the inside with a pierced nipple for a percussion-cap. The upper edge of the hollow cylinder is flanged in such a manner as to rest on top of the stock; thereby preventing the igniter from being driven bodily into the fuze on discharge of the gun. Inside of this hollow cylinder the plunger is hung on a brittle wire (half copper and half lead). When this arrangement is in place the head of the fuze is covered with a piece of paper or linen, luted down and coated with shellac. Thus far the fuze only burns for the full time for which it was pressed. In order to provide for intermediate times, two side channels are bored from the lower end of the fuze upward. Holes bored at equal intervals from the outside of the stock connect the exterior of the fuze with the side channels; the lowest communicating hole in each channel being bored entirely through to the fuze-composition. The channels are filled with mealed powder and paper pasted over the exterior of the time-holes. Upper and lower ends of the stock are served with brass wire.

To use the fuze, with a suitable tool pierce through the communicating hole, which corresponds to the number of seconds desired, into the column of fuze-composition, then push the fuze by hand, giving it a slight twist, into the nose of the projectile, and load the gun. On explosion of the charge the igniter acts as usual, and the fuze-composition burns down to the point at which it was pierced; then the flame flashes into the side channels, down the latter to the lower communicating hole, and thence to the bursting charge.

The bomb- or mortar-fuze consists of a conical wooden plug turned off the proper size of the fuze-hole, and about seven and a half inches in length; the axis of the plug is bored out cylindrically from the large to within a short distance of the small end, the latter being left solid. The plug is graduated and marked on the exterior in inches, the fuze-composition with which it is filled being driven hard and as evenly as possible, so as to burn at the rate of seven seconds to an inch, making the extreme length of the fuze forty-nine seconds. At the large end a cup is hollowed out and filled with mealed powder moistened with alcohol. The rate of burning is ascertained by experiment, and marked on a water-proof covering, which is tied over the cap. A fuze-saw is supplied, and must be at hand during practice, to cut the fuze at the required length.

Fuzes for sea-coast mortars are also driven in conical paper cases marked with the number of seconds they burn per inch. These cases are inserted in a metal or wooden plug previously driven in the fuze-hole, and accurately reamed out.

Base-fuze. With forced and expanding projectiles the flame of the discharge frequently fails to ignite the fuze placed in the forward end of the projectile; there are also objections to the use of the fulminates and chemicals of percussion- and concussion-fuzes. These reasons have led to the invention of time-fuzes placed in the base of projectiles, several kinds of which are now on trial.

Percussion-fuzes are those which are prepared for action by the shock of the discharge, and put in action on striking the object. The only fuze of this kind used in the navy is the *Schenkle-fuze*, which consists of a hollow metallic stock, cylinder, and cap. The stock is made of composition, and in appearance is similar to that of the navy time-fuze. The cylinder is of steel, about an inch and a quarter in length, filled with quick-burning composition, and has fixed at its forward end, in a cylindrical recess, a nipple, projecting slightly, on which an ordinary percussion-cap is placed. The cylinder fits loosely in the fuze-stock, and is suspended by means of a small brass screw, which passes through a hole in the side of the stock and into the cylinder. This screw is not to be removed, or premature explosion in the gun is likely to occur.

A brass cap, plain on one side and countersunk on the other, screws into the head of the stock over the cylinder; the object of its being made with one side countersunk, is to guard against the danger of accidental explosion should the cylinder or plunger become loose, as the cavity is of sufficient depth to prevent contact with the percussion-cap, it being particularly ordered that it shall be screwed in with the cavity next the plunger; *to be reversed only when the shell is entered in the gun, at which time it is absolutely necessary.* In firing, the jar caused by the explosion of the charge in the gun breaks the screw, the cylinder is released and recedes to the bottom of the fuze-case, and upon striking an object of sufficient resistance the cylinder moves forward with violence, the percussion-cap coming in contact with the *plain* side of the brass cap explodes, thereby igniting the fuze-composition, which communicates flame to the bursting charge in the shell. These fuzes are all made of one size.

The best effect of a percussion-fuze is obtained by firing into a mass of timber. They frequently fail if fired into a bank of soft earth, sand, or

other material which does not offer a sufficiently sudden resistance; also, if fired at high angles of elevation, owing to the fact that the rifle-shells do not generally strike point foremost.

Concussion-fuzes are put in action by the shock of discharge, but the action is restrained until the projectile strikes the object. These fuzes, as well as the percussion-fuzes, are wholly independent of the time of flight, and are dangerous to handle on account of the fulminates and chemicals which they contain.

Combination time-fuze. The composition is ignited by a percussion contrivance put in action by the shock of discharge, after which it burns as an ordinary time-fuze.

Fuzes used in torpedoes may be classified as percussion-, friction-, chemical, and electric fuzes.

A *percussion-fuze* is one in which the heat is produced by a blow on some fulminating compound. The blow may be produced by releasing a compressed spring which acts on a hammer, by the dropping of a weight, or by the impact of a moving body.

A *friction-fuze* is one in which the heat is evolved by the friction of a metallic surface on the composition, or by the friction of the particles of the composition on each other.

A *chemical fuze* is one in which substances separated until required for action are then brought into contact, and, uniting chemically, produce heat.

An *electric fuze* is one in which the heat is caused by electricity. The heat may be caused by the shock or blow of disruptive discharge acting on a sensitive composition, or by the heat generated by the passage of an electric current over a conductor of high specific resistance.

Fuzzy. Not firm or sound in substance.

Fyke. A bow-net for taking shad. The *Medusa cruciata*, or Medusa's head.

G.

G. Of the letters used in the log-book to indicate the state of the weather, *g* denotes *gloomy weather*.

Gab. An old but vulgar term for the mouth. *Gift of the gab*, facility of expression. See ECCENTRIC-HOOK.

Gabarre (*Fr.*). A river-lighter. A storeship.

Gabart, or **Gabbert.** A flat vessel with a long hatchway; used in canals and rivers.

Gabbok. A voracious dog-fish in St. George's Channel.

Gaberdine. An old name for a loose felt cloak or mantle.

Gabert. See GABART.

Gable, or **Gabulle.** An old form of *cable*.

Gaby. A conceited simpleton.

Gachupin. A South American name for a Spaniard.

Gadoid. One of a family of soft-finned fishes having the ventral fins below or in advance of the pectoral, of which family the cod is the type.

Gaff. A small spar projecting abaft a mast, which extends the head of a fore-and-aft sail not set on a stay. The inner end is called the *jaws*, and the outer, the *peak*. It has cheek-blocks for the brails, and iron bands with eyes for the vangs, throat- and peak-halliards. It is sometimes stationary, being secured to the mast by eye-bolts on gaff and mast; when fitted to hoist and lower, it slides on a trysail-mast, batten, or jack-stay. For the gear of a gaff, see under proper heads.

A barbed iron instrument for spearing fish.

GAFF-HOOK. A strong iron hook set on a handle for landing large fish that have been caught with a hook and line.

GAFF-NET. A peculiar fishing-net.

GAFF-TOPSAIL. A light triangular or quadrilateral sail set above a gaff. It is seldom used in men-of-war, but forms a part of the rig of all fore-and-afters. For the gear of a gaff-topsail, see under proper heads.

Gage. See GAUGE.

Gained Day. See DAY, CIRCUMNAVIGATOR'S.

Gaining-twist. A term applied to the rifling of a gun when the twist is not uniform, but greater at the muzzle than at the breech.

Gain the Wind. To arrive on the weather side of another vessel when both are working to windward.

Gair-fish. A name for the porpoise.

Gair-fowl. A name of the great auk, *Alca impennis*.

Galaxy (Gr. *gala*, milk). The galaxy, or milky-way (*Via Lactea*), is the great luminous band which stretches across the sky and which forms a zone completely encircling the whole sphere, almost in a great circle. At one part it sends off a kind of branch which unites again with the main body, after remaining distinct for about 150 degrees. This remarkable belt has maintained from the earliest ages the same relative situation among the stars, and when examined through powerful telescopes, is found to consist entirely of stars scattered by millions, "like glittering dust on the black ground of the general heavens."

Gale. A storm. In a gale a ship must scud before it or lie-to. In the Beaufort scale the strength is denoted by 9, 10, 11, or 12, and the velocity is from 20 to 100 miles per hour.

Galeas. See GALLIAS.

Galeopis. An ancient war-ship with a prow resembling the beak of a sword-fish.

Gall. To chafe. See WINDGALL.

Gallants. Formerly, all flags carried at the mizzen were termed *gallants*.

Gallan Whale. The largest whale which visits the Hebrides.

Galleat, or Galliot. A galley having one mast and 16 to 20 oars; at one time used by most of the maritime nations of Europe. Also, a Dutch or Flemish merchant vessel with very rounded ribs and flattish bottom, with a mizzen-mast stepped well aft, carrying a square main-sail and main topsail, a fore-stay to the main-mast (there being no foremast) with fore-stay-sail and jibs. See SCAMPAVIA.

Galleon, or Galion. A name formerly given to ships of war having three decks with guns on each. Also applied to large Spanish merchant vessels, much used as treasure-ships; they were a ready prey on account of their unwieldiness.

Gallery. A balcony projecting from the after part of a ship. See QUARTER GALLERY.

GALLERY-LADDER. Synonymous with *stern-ladder.*

Galley. The cooking apparatus on board ship.

GALLEY-GROWLERS. A term applied to a class of grumblers and croakers on board ship who find fault with the food and spread idle rumors through the ship; hence the terms "galley-news" and "galley-yarn."

GALLEY-NEWS. See GALLEY-GROWLERS.

GALLEY-PACKET. The mythical ship which brings "galley-news."

GALLEY-PEPPER. Soot or ashes which drop into victuals in cooking.

GALLEY-SLANG. The neological barbarisms foisted into sea-language.

GALLEY-STOKER. A skulker.

GALLEY-YARN. An unfounded rumor. See GALLEY-GROWLERS.

Galley. French *galère*, derived from Ital. *galera*, and adopted by the French about 1500. The Italian *galera* was derived from the low Latin *galea*, a helmet, because the figure-head often consisted of a helmet. Ovid says, "*Navis; et a picta casside nomen habet.*" Some etymologists have thought that *galê*, the name applied to the weasel and the cat, was given to this species of vessel on account of its swiftness, slender form, and ease of manœuvre.

The name galley has been in modern times applied to vessels of war, using both sails and oars, which the ancients distinguished according to the number of benches of rowers, as biremes, triremes, etc. There is much uncertainty as to the rig and arrangement of the ancient galleys. It is, however, certain that they were used for war,—often very long, low, originally without a deck, and having one mast. Later, they were constructed with poop and forecastle, for the fighting men, and the masts were made to lower, as in the Roman galleys at the battle of Actium. The Greeks and Carthaginians generally kept their masts up during a fight, and kept hoisted at their yard-arms heavy masses of metal to be dropped upon their assailants, often causing them to sink. The Romans used grappling-hooks with which to hold their galleys fast to those of their enemy, and thus make the fighting hand-to-hand, in which case they were apt to be successful.

The ancient galleys were often armed with a metal spur, or *rostrum.* They were steered by 2 or even 4 broad oars, instead of a rudder.

All galleys in the beginning had only one rank of oars,—the *uniremes* of the Romans, *monêrês* of the Greeks. These galleys were distinguished among themselves by the number of oars, such as *triacontoros*, or 30 rowers, and *pentêkontoros*, or 50 rowers. It is said that the ranks of oars were gradually increased until, like the great vessel of Hiero, built by Archimedes, and that of Ptolemy Philopator, the ranks were raised to 40. Yet, as has been said, no modern has given a thoroughly satisfactory explanation of how these were arranged.

The modern galley was especially in use in the Mediterranean from the 12th to the 18th century. They were very fast, and capable of performing rapid evolutions, their breadth in relation to length being as 1 to 7, or even as 1 to 8 or 9. They were decked, steered by a rudder and tiller, and carried 2 or more lateen-sails, in later times, but the sails were originally square. Each oar was from 40 to 50 feet long, and manned by several men. An ordinary galley pulled 50 oars, and would have from 250 to 300 rowers. A walk or gangway, called the *coursier*, ran along the middle of the deck, along which passed the *comite*, or boatswain and his mates, for the purpose of making the rowers do their best.

Before the invention of gunpowder the sides of galleys were surmounted by a wall or bulkhead of planks, and they had small towers forward and aft, from which archers launched their projectiles. They were also armed with a spur of wood covered with iron. The use of fire-arms caused the towers and spurs to be abandoned, and a heavy piece of artillery and some smaller ones were mounted forward, behind a sort of bulwark called a *rambade.* To prevent boarding they had nettings stretched completely over the rowers and the main deck. The poop, which was higher than the prow, was also defended by bulwarks crenelated for musketry.

The system of recruiting for the rowers of the galleys differed much at different times. During ancient times the rower's place was considered an honorable one. Virgil mentions that the Trojan youth practiced continually at the oar. Later the oar was worked by prisoners of war and black slaves, the latter being especially used by the Carthaginians.

In the middle ages they chained to the same bench infidel prisoners and criminals; and in France justice showed herself more or less severe according to the need of rowers for the galleys. The loss of life in the French galleys was frightful. In 1676 the rowers numbered 4710, but death made such fearful ravages among them that every sort of vagabond was picked up, and even North American Indians were kidnapped for the purpose of being put to the oar.

The treatment of the galley-slaves was terrible, even after the great Colbert had interfered to obtain better treatment for them. Fed principally upon lentils and black bread, with a little fat or oil, and all in insufficient quantity, a traveler who wrote at the end of the 17th century says they were eaten by swarms of vermin and scaly with itch; dressed in a coarse sack, without shoes or cap, they slept upon the hard deck or bench, chained to it and to each other. If necessary during any manœuvre to insure silence, they were gagged. Other particulars still more revolting are given.

In some of the French dock-yards may still be seen galley-slaves working at the oar and performing other hard labor, but the system is fast dying out. The Algerines used galleys up almost to our own time. In 1748 the officers of the

French galleys, who had until then formed a separate corps, were merged in the navy.

The term *galley* was also applied to a ship's boat, generally built for speed.

GALLEY-ARCHES. Spacious and well-built structures in many of the Mediterranean ports for the reception and security of the galleys.

GALLEY-FOIST, or GALLEY-FUST. An obsolete term for a barge of state.

GALLEY-SLAVE. A person condemned to work at the oar on board a galley.

Gallias. A vessel larger and heavier than the ordinary galley; it had castellated structures at the bow and stern for the fighting men.

Gallied. Worried; rattled; thrown out of mental equilibrium.

Galligaskins. Wide hose or breeches formerly worn by seamen, also called petticoat-trousers.

Gallipoli. A seaport town of European Turkey, in Roumelia, on the Sea of Marmora, 132 miles W.S.W. of Constantinople. Lat. 40° 24′ N.; lon. 26° 40′ E. It has two ports, and is the principal station of the Turkish fleet. Pop. 20,300.

Gallipoli. A fortified seaport town of Naples, province of Lecce, 29 miles W.S.W. of Otranto, on a rocky island in the Gulf of Taranto, connected by a bridge with its suburb Lizza, on the mainland. The harbor is between the town and the island of Sant' Andrea, and is 10 to 12 fathoms in depth. Pop. 10,000.

Gallivat. An armed row-boat of India, smaller than a grab, generally 50 to 70 tons. It was built like a *grab*, but not so large; it had two masts with a large triangular sail on the main, and generally a deck made of split bamboo. They carried swivel-guns or small cannon, and sometimes pulled 50 oars, by which they were propelled at the rate of 4 miles an hour.

Gallows. A frame-work above the deck of a flush-decked vessel, used for stowing spare spars; called also *gallows-tops*, *gallows-bitts*, and *gallows-frames*.

Gally-gun. A kind of culverin.

Galore. Plenty; abundance.

Galvanic Battery. The use of electricity as a means of igniting explosive charges is of comparatively recent date. The earliest recorded application of this agent for such purposes was by Moses Shaw, an American, who, in 1831, exploded charges used in submarine blasting by means of an ordinary frictional machine, and who, later in the same year, by advice of Dr. Hare, substituted a galvanic battery for the electrical machine.

In 1839, Lieut.-Gen. Pasley, R.A., while conducting operations for the removal of the wreck of the "Royal George," at Spithead, used a galvanic battery for firing charges of powder. In the same year, Alan Stevenson also applied the same means in submarine blasting.

Probably the most noteworthy of the earlier applications of electricity to firing purposes was that made by William Cubitt, in 1843, when removing the Round Down cliff, on the line of the Southeastern Railroad, near Dover. This cliff was about 400 feet high, and in removing it three charges, containing in the aggregate 18,000 pounds of gunpowder, were fired simultaneously by means of a galvanic battery. The results of the explosion realized the most sanguine expectations of the projectors. Over 1,000,000 tons of chalk rock were thrown down in less than five minutes, £10,000 and twelve months' labor being saved to the company.

The introduction of the torpedo into modern warfare was followed by earnest attempts to so modify its firing apparatus as to place it more under control, thus rendering it safe to friends and less dangerous to handle. Electricity attracted almost immediate attention in this connection, and so satisfactory have been the results obtained by its use, that at the present time it is almost exclusively employed as a firing agent for torpedoes.

The sources of electricity best adapted to torpedo operations are three in number:

1. Contact between dissimilar metals, supplemented by chemical action,—illustrated by any form of galvanic battery.

2. Friction between insulators,—for example, Smith's machine.

3. Mechanical energy so applied as to bring about electro-magnetic induction,—Beardslee's and Farmer's machines.

Much inventive talent has been employed in devising machines of this last class, and, as a result, there is a large number of machines, varying very widely in their properties. They may, however, be divided into two general classes, viz., induction machines of the first class, commonly called magneto-electric machines, and induction machines of the second class, called dynamo-electric machines. The magneto-electric machines, of which Beardslee's machine is an example, give a current approximating to that derived from frictional sources. The dynamo-electric machines—Farmer's for example—give a current similar to that of the galvanic battery.

A source of electricity to be used in extended defensive operations should have the following properties:

1. Its power should be great.

2. It should be ready to act at all times.

3. There should be no expenditure of material when not in action.

4. It should, when used to fire any given torpedo, have no marked inductive influence on neighboring cables.

5. The fuze required should be safe, simple, little affected by climate or storage; should be of such a nature as to allow testing the condition of the circuit, from time to time, and should have such a resistance that moderately poor insulation of the leading wires will not prevent its firing.

6. It should be equally applicable to self-acting torpedoes and those fired at will.

Considered in reference to the above propositions, it will readily be admitted that frictional electricity is of but little value as a firing agent in this class of operations.

First. Although its power can be made as great as desired, it has always to be generated at the moment required, unless we go into a constant expenditure of material to keep the generator continuously in operation.

Second. The inductive influence of a current derived from frictional sources is very marked.

Explosions of fuzes in neighboring circuits have been experienced at the Torpedo Station, due to no other cause than this, and it is also probable that to the same cause were due the "spontaneous explosions" encountered by the Austrians in their earlier experiments.

Third. The fuze best adapted to frictional electricity is not only extremely sensitive and dangerous, but is also very liable to injury in storage, and renders it impossible to test the circuit at any time; but, above all, it has such a high resistance that the slightest defect in the insulation of the connecting wires will render it impossible to fire, no matter what may be the power of the machine used.

Fourth. Electricity from frictional sources cannot easily be used with self-acting or contact torpedoes.

Frictional electricity being then of little value in this class of operations, let us now consider how well induction machines will answer as a substitute. The current derived from the first class of these machines, approximating to that obtained from frictional sources, we would naturally expect that the same objections would apply. This is the case, the only advantage possessed by these machines being that the fuze required admits of testing, and is less sensitive, and therefore safer. It is, however, more liable to injury in transportation and storage, and has also a very high resistance, which prevents its use with poorly-insulated wires. The inductive influence of the current of these machines is not so marked, but is greater as the machines more nearly approach the frictional in the character of the current furnished.

Induction machines of the second class more nearly fulfill the required conditions. The inductive influence on neighboring cables is slight. They can be used, when in action, equally well with contact torpedoes or those fired at will. The fuze (platinum wire) best adapted to these machines is simple, safe, sure, offers every facility for testing, is but little affected by climate, transportation, or storage, and, at the same time, has very low resistance, and can be fired when the insulation of the leading wires is very defective. However, these machines are not ready to act at all times, unless machinery be provided for driving them, which involves a constant expenditure of material; for this reason they must be condemned for defensive operations.

Frictional and induction machines being thus disposed of, there is left only the galvanic battery.

1. The power of a galvanic battery is only a question of the number of cells used, and can be made anything desired.

2. It is always ready to act, requiring only that its circuit be complete.

3. In a properly constructed battery, properly cared for, there is but little or no expenditure of material, when not in action.

4. Its current has practically no inductive influence on neighboring cables.

5. The platinum wire fuze can be used, bringing with it all the advantages enumerated above, and enabling us, by simply increasing the number of cells, to overcome all reasonable defects of insulation.

6. It can be used indifferently with contact torpedoes or those fired at will.

7. It is easily procured, and in case of necessity, a fair battery may readily be improvised.

In view of all these points, the galvanic battery seems to be peculiarly adapted for use as a firing agent in defensive operations.

A good battery should have the following qualities: it should produce a high electro-motive force; its electro-motive force should be constant, whether used to produce strong or weak currents; it should have a small and constant internal resistance; the materials employed should be cheap and readily obtainable, particularly the material consumed; no material should be expended when the battery is not employed to produce a current. This last point is generally attained when the cells are properly insulated from each other, the battery itself well insulated, and the zincs carefully amalgamated.

The electro-motive force and resistance per cell of any form of battery are known as its *electrical dimensions*, and it is the relative values of these two quantities which must be the guide in selecting batteries for particular purposes.

The simplest form of galvanic battery consists of two plates of dissimilar metals plunged into a liquid. A copper and a zinc plate in dilute sulphuric acid or water are generally used. When the two plates are brought into contact or joined by a conducting wire, a current of electricity flows from the copper to the zinc, through the conducting wire, and from the zinc to the copper, through the liquid. The passage of the current through the liquid is attended by chemical action. The sulphuric acid attacks the zinc, forming sulphate of zinc and liberating hydrogen, which is carried over, and given off at the copper plate.

This battery is found to be of no practical use; its electro-motive force decreases rapidly, and at the same time its resistance is constantly increasing, until finally the action altogether ceases. This inconstancy has been found to be due to the action of the liberated hydrogen, which, instead of passing off at the copper plate, clings to it, generating an opposing electro-motive force, which subtracts from the original force of the combination. The hydrogen has still another detrimental action; after the circuit has been closed for some time, the sulphate of zinc formed permeates the whole solution; the hydrogen acts on this sulphate, depositing zinc on the copper plate, and thus weakening still further the battery. Attempts to so dispose of this hydrogen that its action shall not be detrimental have resulted in many more complicated forms, called *constant* batteries.

Daniell's battery consists of a zinc plate, in either a solution of sulphate of zinc, or dilute sulphuric acid, and a copper plate in a saturated solution of sulphate of copper. The two solutions are separated by a porous cup. To the sulphate of copper solution a little sulphuric acid is sometimes added to increase its conductivity.

This battery is very constant, particularly when the sulphate of zinc solution is kept at half saturation; its electro-motive force is about .98 volt, and its internal resistance varies from 4 to 10 ohms, according to size and construction. The plates used should be of the same surface, the copper being the larger, if either, and the zinc plate should be in the larger vessel.

The Gravity battery is a modification of Daniell's. In the bottom of a glass jar is a copper plate, surrounded by crystals of sulphate of copper; to the copper plate is soldered an insulated wire, which leads up to the top of the jar; the jar is filled with water, to which a little sulphate of zinc is sometimes added; in the top of the jar is suspended an annular zinc plate.

In the form of this battery in use at the Torpedo Station, the E. M. F. is about one volt, the resistance about 2.4 ohms. In one particular case, in which the copper plate is disposed as a band around the interior wall of the jar, the resistance is as low as 1.4 ohms.

In this battery the difference of the specific gravities of the two solutions keeps them separate; therefore, the battery should never be so agitated as to cause the solutions to mix. This battery is very constant, and with reasonable care can be used for months without re-setting.

The Le Clanché battery consists of a glass jar, and a porous cup which is glazed for half its length. In the porous cup is placed a carbon plate, surrounded by a mixture of gas carbon and the needle form of peroxide of manganese (black oxide). Both the carbon and the manganese should be sifted to get rid of any fine dust, which would materially interfere with the action of the battery. The top of the porous cup is sealed with pitch. The glass jar contains a zinc rod, and is half filled with a weak solution of ammonic chloride (sal-ammoniac). The E. M. F. of this battery is about 1.48 volts, and the resistance for the quart jar from 2.5 to 3 ohms.

The battery should not be used on short circuits where constant work is required, but for intermittent work it is valuable, constant, and requires but little care. A battery of this kind, carefully prepared at the outset, can be used for ten or twelve months without change, except to supply what the solution loses by evaporation. Sea-water is a very good substitute for the sal-ammoniac solution.

Grove's battery consists of a zinc plate in dilute sulphuric acid (generally one part of acid to ten or twelve of water), and a platinum plate in strong nitric acid, the two solutions being separated by a porous cap. The E. M. F. and resistance of this battery are reasonably constant; the latter, however, increases somewhat with the time the battery has been in operation. With the ordinary quart jar, the E. M. F. is about 1.8 volts, and the resistance from .3 ohm, when first set up, to .8 ohm, after working a few days.

Bunsen's battery is the same as the Grove, with the exception that carbon is substituted for platinum. The E. M. F. and internal resistance of the Bunsen are both somewhat greater than those of the Grove. The principal objection to both these batteries is the nitrous fumes given off, which are very unpleasant, and also particularly destructive to any electrical apparatus exposed to their influence.

Station battery.—At the Torpedo Station a modification of Bunsen's battery is much used; the porous cup is charged with a mixture of nitric acid and a solution of bichromate of potash (Gibb's solution). This solution is prepared as follows: a saturated solution of the bichromate is made, to which is added one-fourth its volume of strong sulphuric acid. In charging the battery, five parts of this solution are mixed with one part of strong nitric acid; dilute sulphuric acid (one to twelve) is used in the outer jar. The battery is reasonably constant; its E. M. F. is about two volts, and its resistance for the quart jar varies from .5 ohm, when first set up, to something over an ohm at the end of two weeks. No nitrous fumes are given off, which is a great advantage where instruments are used in connection with the battery.

Pneumatic battery.—A small compact battery invented by Lieut. J. P. Merrell, U.S.N. It is supplied to all government vessels for use in boats, for which it is very well adapted, being compact and transportable, and possessing sufficient power to fire through a resistance of 2.7 ohms. The liquid (Hertz's battery solution) is separate from the plates, and can only be brought in contact with them by blowing through a rubber tube attached to the outer jar.

Selection of batteries.—In torpedo work batteries are used for three distinct purposes, viz., signaling, testing, and firing. The qualities demanded in a signal or testing battery are identical; it must be constant and must give a weak current, certainly one 50 per cent. below that required to fire the fuze used. A firing battery, on the contrary, must be capable of generating a very strong current, and must have as great constancy as can be obtained without sacrificing this prime consideration.

The electrical dimensions of a battery form the only criterion by which to judge of the current which it is capable of producing; and it is evident that for a signal battery one should be selected which, being very constant, has, at the same time, a low E. M. F. and large internal resistance; while, for a firing battery, one of great E. M. F., low internal resistance, and fair constancy should be chosen.

For a signal or testing battery, either a Daniell, Gravity, or Le Clanché should be chosen, for they are all three very constant, and their electrical dimensions are suitable. Perhaps for a signal or a testing battery, where the work is not continuous, a Le Clanché would be the best, as it requires less care than any of the others; but for a testing battery, where the work is so much that it may practically be considered continuous, the Daniell or Gravity would be most suitable.

The Grove, Bunsen, and Station batteries, in point of electrical dimensions and constancy, are suitable for firing batteries. The Grove and Bunsen are, however, objectionable on account of the nitrous fumes given off, which soon destroy all electrical apparatus used in connection with the batteries. The Station battery of half-gallon jars makes a very efficient firing battery; its power is ample, and it is very easily cared for.

In the English service, a battery (known as Walker's battery) consisting of large plates of carbon and zinc plunged into very large vessels containing dilute sulphuric acid, has been adopted as a firing battery; and in this country a similar form, consisting of a plate of lead or chrome iron between two plates of zinc, the plates being very near together, has been recommended. In both these forms the plates are kept suspended over the acid, and are lowered when it is desired to fire. They may easily be so arranged as to be lowered by the action of the signal battery.

A portion of the firing battery may be used as a signal battery; but, as accident is possible with this arrangement, it should not be adopted when a suitable signal battery can be obtained. With either of the batteries mentioned above as suitable for signal purposes the torpedo cannot be fired, no matter to what extent the cells may be multiplied, provided they are always connected

in series; for this reason, signal batteries should always be connected *in series*.

Arrangement of battery cells.—Batteries are not always arranged in the same way, but are differently grouped, according to the results desired. The positive pole of one cell may be connected to the negative pole of the next, in which case the battery is said to be connected *in series*; or, the positive poles may all be connected together, and also the negative, which connection is said to be for *conductivity*; and last, the cells may be grouped, *i.e.*, part connected *in series* and part for *conductivity*. See ELECTRICITY.

Electrical measurements.—A knowledge of the strength of current required to fire the fuzes used, of the resistance of the circuit, and of the dimensions of the battery chosen, must determine the number and arrangement of the cells of a firing battery. The current necessary to fire a given fuze is practically a constant quantity, and should be determined in the laboratory, and furnished with the fuzes. The resistances of the circuits and dimensions of the batteries being subject to change from a variety of causes, a satisfactory knowledge of their value can only be obtained by actual measurement. In a well-conducted system of torpedo defense, such measurements would be made and recorded daily, thus giving a positive indication of the parts of the system needing attention or repairs, and particularly of the time when the batteries should be renewed.

These measurements are all based on well-known electrical principles, which, together with a description of some of the instruments used, are given below.

The units used are the *ohm*, *volt*, and *weber*. *The ohm* is the *unit of resistance*, and is the resistance offered by a round wire of pure copper, 10′ long and .01″ in diameter, at 42° F.

The volt is the unit of E. M. F., the E. M. F. of the Daniell or Gravity cell being a rough approximation to the unit.

Strength of current is defined as the quantity of electricity which flows by any section or point of a conductor in a given time, and is expressed in *webers*, the weber being the unit quantity in a second of time. The unit quantity is a *farad*; a weber current will be, then, one in which a farad passes every point of the conductor in a second of time.

A tangent galvanometer and box of resistance coils will suffice to make all the measurements likely to be required in torpedo practice.

A box of resistance coils consists of a number of spools of fine German silver or platinum silver wire placed in a box, and so arranged that one or all of them may be conveniently introduced into a circuit. The wire on the spools is carefully insulated, wound on the bight, and that on each spool has a definite resistance. Such values are generally given to the spools that, by different combinations, any resistance from 1 ohm to 10,000 ohms may be obtained.

A tangent galvanometer is an instrument used for measuring strengths of current, and, indirectly, resistances of conductors. It consists generally of a fixed coil of wire, so placed as to influence a compass-needle; the radius of the coil should be large in proportion to the length of the needle. The arc of the compass is graduated to degrees and fractions of a degree, ranging from 0°, at the north and south points, to 90°, at the east and west points.

If a current is passed through the instrument, the compass-needle will be deflected to the right or left, according to the direction of the current, and the tangent of the angle of deflection of the needle will be proportional to the strength of the current. The number of turns and the resistance of the wire in the coil determine the adaptability of the instrument to different classes of measurements. When in use, the instrument is so adjusted that the coil lies in the plane of the magnetic meridian when the needle stands at zero.

Farmer's modification of the Gaugain galvanometer is a very useful form of this instrument. It consists of four vertical coils of wire, placed two on each side of the needle, their centres being on the same horizontal line; between the coils is a compass, with a circle graduated, as above described. The point of suspension of the needle lies in the same horizontal line as the centres of the coils, and at a distance from the centre of each coil equal to one-half the radius of the coil; this having been found to be the best construction. One coil on each side consists of a number of turns of fine insulated wire, and has a resistance of 24 ohms; and the other of one turn of very coarse copper wire, whose resistance is practically zero.

At the front of the instrument is a key-board, so arranged that, by placing the pins properly, a current may be sent through either fine coil, through one fine coil after the other (tandem), in branch circuits through the two fine coils (team), and in the same ways for the coarse coils, thus giving virtually six different galvanometers in the one instrument. At the rear of the galvanometer is a commutator, by which the direction of the current through the instrument can be reversed.

Table of Batteries.

Size of Cell.	Name.	E. M. F. per Cell.	Resistance per Cell.	Constancy.	Used for—
Quart.	Daniell...............	0.98 volt.	4 to 6 ohms.	Very constant..................	Testing and signaling.
"	Gravity	1 "	2.4 "	" "	" "
"	Gravity (with copper band).	1 "	1.4 "	" "	Firing on short circuits, dangerous for signaling.
"	Le Clanché.........	1.48 "	2.5 to 3 "	Very constant on long circuits or for intermittent work on short circuits.	Testing and signaling, particularly for signaling.
"	Grove and Bunsen	1.8 "	0.3 to 0.8 "	Fairly constant................	Firing, bad for instruments.
"	Station..............	2 to 1.8 volts.	0.5 to 1 "	" "	Firing.
½ gal.	Station..............	2 to 1.8 "	0.25 to 0.5 "	" "	"

Galvanized Iron. Iron the surface of which is alloyed with zinc. The iron is cleansed, heated, and plunged into a bath of melted zinc covered with sal-ammoniac.

Galvanometer. An instrument for measuring electric currents. See GALVANIC BATTERY.

Galveston. A port of entry and the most populous and commercial city of Texas, situated on the Gulf of Mexico, on Galveston Island, in Galveston Bay. Lat. 29° 18′ N.; lon. 94° 50′ W. The harbor, which is the best on the Texas coast, has 12 or 14 feet of water over the bar at low tide. The chief articles of export are cotton, hides, grain, and pork. Value of annual exports about $33,000,000. Steamships make regular trips from this port to New York, Havana, Liverpool, etc. Pop. 31,000.

Galway. A town and seaport on the west coast of Ireland, situated on the north side of Galway Bay. Lat. 53° 15′ 12″ N.; lon. 9° 3′ 30″ W. The commerce of the town was at one time considerable, but has now declined. Pop. 16,000.

Gama, Vasco da, the discoverer of the maritime route to India, was born at Sines, a small seaport of Portugal. In what year he was born is not known. Five years after the corroboration by Columbus of the spherical form of the earth, and the successful exploration by Diaz of the passage round the Cape of Storms, the King of Portugal dispatched three vessels under Da Gama to find the shores of India and open a traffic with the people. The voyage, well described by Camoens in the "Lusiad," was perfectly successful. After establishing communication with the natives of Hindostan at Calicut, on the Malabar Coast, Da Gama returned to Portugal in 1499. The rejoicings of the court and the people were boundless,—wealth and power were in their grasp. A second expedition, on a larger scale than the first, was equipped, and Da Gama placed in command. Proceeding along the eastern coast of Africa, he landed at some places to punish the Moors for certain treacheries practiced on him during his former voyage; he continued his voyage, and, reaching Cochin in the south, he founded a port and factory. From that date the commerce of Europe with India, round the Cape of Good Hope, was established, and the wealth and consequence of the Italian republics declined in proportion as the traffic was withdrawn from the Red Sea route. He died at Cochin, December, 1525. His body was conveyed to Portugal and buried with great pomp.

Gambling. Gambling is strictly prohibited on board men-of-war; even card-playing is interdicted except in the cabin of the commanding officer.

Gammon. To pass the gammoning to secure the bowsprit. Humbug; hoax.

GAMMONING. Seven or eight turns of a lashing passed over the bowsprit and through the gammoning-hole, to secure the bowsprit. The lashing was formerly of rope, later of galvanized chain, and is now superseded by iron bands setting up with nuts and screws. When rope or chain was used the turns of the lashing were crossed, the forward turn on the bowsprit being the after turn in the gammoning hole.

GAMMONING-FASHION. A term applied to a lashing in which the turns cross after the manner of the gammoning.

GAMMONING-FISH. A batten on the upper side of the bowsprit, over which the turns of the gammoning were passed.

GAMMONING-HOLE. A scuttle cut through the knee of the head, through which the gammoning was passed.

GAMMON-KNEE. A knee-timber bolted to the stem just below the bowsprit.

GAMMON-PLATE. An iron plate bolted to the stem of some vessels to support the gammoning.

GAMMON-SHACKLE. The shackle of the gammon-plate.

Gand-flook. A name of the saury-pike, *Scomberesox saurus.*

Gang. A number of the ship's crew employed on any particular service and under the charge of an officer or petty officer.

Gang-board. A plank with several cleats nailed to it for convenience in passing back and forth from a vessel to the wharf.

Gang-cask. A small barrel used for bringing water on board in boats; larger than a breaker.

Gang-plank. See GANG-BOARD.

Gangway. Formerly, in deep-waisted ships, a platform from the poop to the topgallant forecastle; the name is now applied to that portion of the spar-deck over which this platform extended. A thoroughfare of any kind; but more especially applied to the aperture in the ship's side for the accommodation of persons entering and departing. *To bring to the gangway*, to bring a seaman to that place to be flogged.

GANGWAY-LADDER. The ladder extending from the gangway to the water's edge; the accommodation-ladder.

Ganneret. A species of gull.

Gannet. The *Sula bassana*, or solan goose, a large sea-bird of the family *Pelecanidæ*, common on the Scottish coasts.

Ganoidian. One of an order of fishes characterized by having shining bony scales or plates, the gills as in ordinary fishes, but the optic nerve not decussating. The ganoids were among the earliest of fishes in geological time, and became afterward very numerous, but are now of few species. The order includes the modern gar and the sturgeon.

Gantan. An Indian commercial measure, of which 17 make a baruth.

Gant-line. Synonymous with *girt-line* (which see).

Gant-lope, or Gauntlope (commonly pronounced *gantlet*). A race which a criminal was sentenced to run, in the navy or army, for some heinous offense. The ship's crew, or a certain division of soldiers, were disposed in two rows face to face, each provided with a knotted cord, with which they struck the delinquent as he ran between them, stripped down to the waist. This was repeated according to the sentence, but seldom beyond three times, and constituted *running the gauntlet.*

Gantree, or Gantril. A wooden stand for a barrel.

Gape. The principal crevice or crack in shaken timber. The seams *gape*, or let in water.

Gaper. A fish with six or seven bands and tail undivided.

Garbel. A word synonymous with *garboard* (which see).

Garbling. The mixing of rubbish with a cargo stowed in bulk.

Garboard-strake, or Sand-streak. The first range of planks laid upon a ship's bottom, next the keel, into which it is rabbeted, and into the stem and stern-post at the ends.

Gare. See GAIR-FOWL.

Gar-fish. The *Belone vulgaris*, or bill-fish, the bones of which are green. Also called the *guard-fish*, but it is from the Anglo-Saxon *gar*, a weapon.

Garganey. The *Querquedula circia*, a small species of duck, allied to the teal.

Garland. A collar of ropes formerly wound round the head of the mast to keep the shrouds from chafing. A strap lashed to a spar when hoisting it in. A rope grommet, to place shot in on deck. A wreath made by crossing three small hoops, and covering them with silk and ribbons; in early times it was hoisted to the main-topgallant-stay on the day of the captain's wedding; but on a seaman's wedding, to the appropriate mast at which he was stationed. Also, a sort of net used by sailors to contain their provisions, being hung up safe from cats, rats, ants, and cockroaches.

Garnet. A sort of purchase fixed to the main-stay of a merchant ship, and used for hoisting the cargo in and out. A pendant rove through a hole in the spar-deck and hooked to the cascabel of a gun in getting it out or taking it in through a port. See CLEW-GARNET.

GARNET-TACKLE. The tackle hooked to the upper end of the garnet,—the pendant-tackle.

Garney. A term in the fisheries for the fins, sounds, and tongues of the cod-fish.

Garnish (*Eng.*). Profuse decoration of a ship's head, stern, and quarters. Money which pressed men in tenders and receiving-ships exacted from each other according to priority.

Garr. An oozy vegetable substance which grows on ships' bottoms.

Garrooka. A fishing-craft in the Gulf of Persia with overhanging bow and stern.

Garter-fish. A fish having a long, depressed body, like the blade of a sword; the *Lepidopus.*

Garters. A slang term for leg-irons.

Garth. A fish-weir.

Gas-check. A ring or plate of metal designed to prevent the escape of gas in breech-loading arms.

Gasket. Plaited stuff or a small line used to confine a sail to its yard when furled. The *harbor-gaskets* are made of plaited stuff painted black, and receive different names according to the positions they occupy; as, yard-arm-, quarter-, and bunt-gaskets; the yard-arm- and quarter-gaskets are passed square, and the bunt-gaskets cross each other,—they are sometimes stitched together at the cross, and sometimes a net is wove between them. A *sea-gasket* is a long line which is passed around the yard and sail; it is used at sea when neatness is not so much an object as security; it is sometimes called a *furling-line.* A ring of india-rubber, canvas, sheet-lead, or other packing material, placed between flanges, such as those of cylinders, pipes, man-hole plates, etc., for the purpose of making a steam-, water-, or air-tight joint.

Gat. A swash-way or channel among shoals.

Gate, or Sea-gate. When two ships are thrown on board one another by a wave they are said to be in a *sea-gate.*

Gather Aft. To take in the slack of a sheet which has been flowing.

Gather Way. To begin to feel the impulse of the wind on the sails, so as to obey the helm.

Gath-linn. A name of Polaris,—from two Gaelic words signifying ray and moisture, in allusion to its subdued brightness.

Gatling-gun. See MACHINE-GUNS.

Gaub-line. See GOB-LINE.

Gauge. To measure. A standard of any kind. An instrument to ascertain or regulate the dimensions or form of any particular thing. (See GUNS, INSPECTION OF.) Position of a vessel with regard to the wind and another vessel. *To have the weather-* (or *lee-*) *gauge*, to be to windward (or to leeward) of a vessel. In former days it was considered very important to have the weather-gauge, and fleets sometimes manœuvred for hours to obtain this advantage.

GAUGE-COCK. One of a number of small cocks inserted in the shell of a steam-boiler at about the proper water-level, which indicate, by the small jet of steam or water drawn from them, the height of the water in the boiler. One cock is placed at the lowest limit of safety, one at the highest, and one or more placed at equal distances between them. The steam-jet, water-jet, and a mixture of the two, are easily distinguished either by sight or sound. There are many varieties of gauge-cocks.

GAUGE-ROD. A rod provided with a hook and handle for operating gauge-cocks when beyond reach of the hand. A rod or stick of light wood used as a float in a mercury siphon gauge, usually called a gauge-stick. Any rod, graduated or not, used to gauge or measure the distance between two points.

Gaugnet. The *Sygnathus acus*, sea-needle, or pipe-fish.

Gaut. In the East Indies, a landing-place; also, a range of hills.

Gavelock. An old term for a pike.

Gaver. A name for the sea cray-fish.

Gavial. A genus of reptiles of the crocodile family inhabiting the Ganges; it differs from the true crocodile and alligator in the great length and slenderness of the muzzle.

Gaw. A term for a boat-pole.

Gawdnie. The dragonet or yellow gurnard, *Callionymus lyra.*

Gaw-gaw. A lubberly simpleton.

Gawky. The shell called horse-cockle. Awkward; lank.

Gawlin. A small sea-fowl which the natives of the Western Isles of Scotland trust in as a prognostication of the weather.

Gawpus. A stupid, idle fellow.

Gawrie. A name for the red gurnard, *Trigla cuculus.*

Gaydiang. A vessel of Anam, resembling in construction a Chinese junk.

Gazzetta. The name of a small coin in the Adriatic and Levant. It was the price of the first Venetian newspaper, and thereby gave the name to those publications.

Gear (Ang. Sax. *geara*, clothing). A general name for ropes belonging to any particular spar or sail; and for the implements used in any operation; as, *shaving-gear*, *mess-gear*, etc.

Gearing. A combination of wheels and pinions, or shafts and pulleys.

Gears, or Geers. See JEERS.

Gee. To suit or fit; to answer the purpose required.

Geelong, a town and seaport of Victoria, S.E. Australia, near the head of Geelong harbor, an arm of Corio Bay, 40 miles S.W. of Melbourne. Lat. 38° 8′ S.; lon. 144° 25′ E. The harbor, naturally good, has been much improved by dredging and by construction of jetties. Pop. 15,200.

Gefle. A fortified seaport town of Sweden, at the mouth of the Gefle River. The river here separates into three arms, inclosing two islands, on which and on both banks the town is situated. The harbor is excellent. It has ship-yards, sugar-refineries, and tanneries, and exports iron and agricultural products. Pop. 17,700.

Gellywatte. An old term for the captain's boat,—the origin of jolly-boat.

Gemini, Constellation of (*Lat.* "The Twins"). The third constellation of the zodiac, lying between Taurus and Cancer. The two principal stars are α^2 *Geminorum* called *Castor*, and β *Geminorum* called *Pollux*. They may at once be found, as they form, with the two bright stars of Auriga, an arch round the head of Orion. As they rise, Capella is the uppermost star of the pair in Auriga, and Castor is the uppermost of the pair in Gemini; or, again, a line joining Rigel and Betelgeux, and continued a little more than its own length, gives Pollux, and is also bisected by γ *Geminorum.*

GEMINI, SIGN OF. The third sign of the ecliptic, including from 60° to 90° longitude. Owing to the precession of the equinoxes, the sign is at present in the constellation Taurus. The sun is in Gemini from about 21st May to about 21st June. Symbol Π.

Gemma (*Lat.* a jewel). The star α *Coronæ Borealis.*

General Average. See AVERAGE.

General Orders. Orders relating to the whole command, in contradistinction to *special* orders, or those relating to only a portion of the command.

General Ship. When persons unconnected with each other send freight in a ship she is called a *general*, in contradistinction to a *chartered*, ship.

Generator. An apparatus in which vapor or gas is formed from a liquid or solid by means of heat or chemical process, as a steam-boiler, gas-retort, or vessel for generating carbonic acid gas, etc. Also, a machine for transmuting work into electricity.

Genoa, a fortified seaport of Northern Italy, on the Mediterranean, between the rivers Bisagno and Polcevera. Lat. 44° 24′ 54″ N.; lon. 8° 53′ E. The city is inclosed by a double line of fortifications, forming a vast semicircle, supported by numerous detached outworks, constituting one of the most extensive town fortifications in Europe. The port is of a semicircular form, about three-quarters of a mile in diameter, formed by two moles projecting into the sea from opposite sides, but not opposite each other. There are yards for naval construction. The harbor is safe and good, but much too small for the needs of the port; hence new harbor works are in course of construction. Pop. 161,700.

Gentle. A grub used as bait in angling.

Gentle Airs. Breezes which are barely appreciable, not exceeding a velocity of 1.5 miles per hour; they are indicated by 1 on the Beaufort scale.

Geocentric (*gē*, the earth; *kentron*, the centre). Concentric with the earth; distinguished from *heliocentric*, concentric with the sun. The geocentric place of an object is its position referred to a celestial sphere having the centre of the earth for its centre; the heliocentric place is its position referred to a celestial sphere concentric with the sun: the former supposes the spectator to be in the centre of the earth, the latter in the centre of the sun. Thus, we have geocentric longitudes and latitudes, and heliocentric longitudes and latitudes.

Geodesy. The science of the measurement of the earth's surface, and of great portions of it. Geodesy has many physical difficulties to contend against. In measuring a particular length with a view to obtaining a base-line for calculating other lines by trigonometrical observations, there is first a difficulty arising in the use of the unit of length, whatever it may be, whether rod or chain. In the use of rods, it is difficult to lay them all precisely in the same direction, and to prevent error arising from intervals between the rods. In the use of chains, again, the greatest care is needed to keep all the links stretched, while the difficulty of avoiding error through not preserving the line of direction is but little diminished. Further, in all cases, the tendency of the units to change magnitude with changes of temperature, and the unevenness of the earth's surface, are prolific sources of error. After all these difficulties have been overcome and a sufficient base-line obtained, a new class of difficulties are encountered. In taking trigonometrical observations of distant objects, it is found that the three angles of any triangle which we may form are together in excess of two right angles; the angles are, in fact, more of the nature of spherical than plane angles. For this, in using the angles as plane angles (for greater simplicity), a correction has to be made. Further, a correction is required for the effect of horizontal refraction on the results of observations of distant objects,—a most fluctuating source of error, to evade which, as far as possible, it is usual to make observations when the atmosphere has been for some time undisturbed. See COAST SURVEY.

Geo-graffy. A beverage made by boiling burnt bread in water.

Geo-navigation. A term proposed by some writers to distinguish that branch of navigation in which the position of the ship is determined by dead-reckoning, cross-bearings, soundings, etc., from the other branch in which the position is determined by observations of the heavenly bodies, which by them is distinguished as *celo-navigation.*

Georgetown. Capital of British Guiana, on the east bank of the Demerara River, at its mouth. The town has a good water-supply, and has telegraph-lines to America and Europe *via* Cuba and Brazil. There is a bar at the river's mouth with but 8 feet of water, and large ships discharge and load by means of lighters. Pop. 37,000.

Georgium Sidus. The planet discovered by Sir W. Herschel was so named at first; but astronomers adopted Uranus instead, as safer to keep in the neutral ground of mythology.

Gerletroch. The *Salmo Alpinus*, red char, or galley-trough.

Germany, Navy of. There was scarcely any naval establishment in Germany prior to 1848, and even at that time it was begun on a small scale. The unification of the empire, the consequent accession of additional ports, and the augmented warlike contingencies have, however, accelerated the growth of the armament, and by the latest available returns the navy consisted of 20 ironclads, 59 unarmored steamers, and 4 sailing-vessels. In addition to the vessels named, there are two or three torpedo-steamers, protected by steel armor, and capable of moving at the rate of 20 knots per hour. Five thousand five hundred men and boys man the German navy, which is officered by 1 admiral, 1 vice-admiral, 4 rear-admirals, 68 captains, and 351 lieutenants. There are, besides, 10 companies of marines, 6 of infantry, and 3 of artillery, numbering 1500 men. Conscription is the rule of recruitment in Germany, both in the navy and army.

Gerrack. A coal-fish in its first year.

Gerret. A samlet or parr.

Gerrick. A name for a sea-pike.

Gerron. A name for the sea-trout.

Ghee (*Eng.*). The substitute for butter served out to ship's companies on the Indian station.

Ghost. A false image in the lens of an instrument.

Giant-powder. See EXPLOSIVES.

Gib. A term sometimes applied to the projecting arm of a crane or derrick. A piece of metal or wood to hold another in place. *Gib and key*, the fixed wedge and the driving wedge for tightening the strap which holds the brasses at the end of a connecting-rod, or other rod of a steam-engine. Short for Gibraltar.

Gibb. The beak or hooked lip of a male salmon.

Gibbous. A term descriptive of the shape of the disk of a heavenly body when it assumes a form intermediate between a circle and a semicircle.

Gib-fish. A name for the male of the salmon.

Gibraltar. A town and strongly fortified rock at the southern extremity of Spain, belonging to Great Britain. Lat. 36° 9′ N.; lon. 5° 21′ W. The immense strength of the fortress excites wonder and admiration, and renders it impregnable; it is the ancient Calpe, which, with Abyla on the opposite shore of Africa, obtained the name of the Pillars of Hercules. The height of the rock, according to Cuvier, is 1437 English feet: it was taken by the Saracens under Tarik (*Gibel-Tarik*, Mountain of Tarik, whence its present name) in A.D. 712. In the year 1462 the king of Castile took Gibraltar from the Moors; and the English, under Sir George Rooke, the Prince of Hesse-Darmstadt, Sir John Leake, and Admiral Byng, bravely won it, July 24, 1704. It was surrendered, after a dreadful cannonade, to the British, by the governor, the Marquis de Salines, and it has since continued an appendage to the British crown. The principal buildings are the governor's and lieutenant-governor's houses, the admiralty, naval hospital, victualing office, and barracks. Pop., including the garrison, 26,470.

Giddock. A name for the sand-launce or sand-eel, *Ammodytes tobianus*.

Giffoot. A Jewish corruption of the Spanish spoken at Gibraltar.

Gift-rope, or Guest-rope. An old name for the line by which a boat makes fast to the swinging-boom. See GUEST-WARP BOOM.

Gig. A long, narrow boat used by the commanding officer; it is generally clinker-built and single-banked. A sort of spear for taking fish.

GIGSMAN. One of the gig's crew.

Gijon. A fortified seaport town of Spain, on the Bay of Biscay. The town contains ship-yards, a school of navigation, and a large public library. Pop. 6600.

Gilbert, Sir Humphrey. This brave man, who has often been called the real founder of the empire of North America, made himself conspicuous by his services as a British soldier in the first instance, and afterwards as an adventurer in the interest of a party who had obtained Queen Elizabeth's leave to occupy and colonize Virginia. The patent which Sir Humphrey obtained authorized his discovery and possession of any lands that might be yet unsettled. Sir Humphrey made two attempts to reach the shores of Virginia and the Carolinas, but he could not get beyond Newfoundland. Here he took possession of the harbor of St. John's, and then returned to England to die. He left behind him a good name as a valiant soldier, an able navigator, and a sound arithmetician.

Gildee. A name in the Scottish isles for the *Morrhua barbata*, or whiting-pout.

Gil-guy. A name applied to various devices for expediting manœuvres, especially when the device is not very efficient.

Giller. A horse-hair fishing-line.

Gills. Small hackles for drying hemp.

Gilpy. Adolescent.

Gilse. Misnomer for *grilse*.

Gilt-head, or Gilt-poll. The *Sparus aurata*, a fish of the European and American seas with a golden mark between the eyes.

Gimbals (formerly *Gimmals*, akin to Lat. *geminus*, double). Pairs of brass hoops or rings which swing one within the other on diameters at right angles to each other, the pivots being on the inner surface of each successively larger hoop. Anything suspended in their centre retains a constant position relatively to the horizontal plane in whatever direction the framework is tilted; used for hanging compasses, barometers, etc.

Gimlet-eyed. Keen-eyed.

Gimmals. The old form for *gimbals* (which see).

Gin, or Gin-block. An iron frame fitted with a metal sheave; used for topsail-tyes, and for whips for loading and discharging cargo.

Gingado. See JERGADO.

Gingal, or Jingal. A long-barreled fire-arm used in the East, especially in China; it frequently loads at the breech.

Ginger. To spur up; to revive one's flagging energies.

Gingerbread-work. Carved decorations.

Gingerly. Fastidiously; daintily; cautiously.

Ginners, or Ginnles. The gills of fish.

Ginseng. A Chinese root, formerly highly prized for its restorative virtues. It is now almost out of the *Materia Medica*.

Gip. To take the entrails out of fishes.

Girandole. Any whirling fire-work.

Girdle. An additional planking over the

wales or bends. A frapping for girding a ship.

Girt. The situation of a ship which is moored so taut by her cables, extending from the hawse to two distant anchors, as to be prevented from swinging to the wind or tide. The ship thus circumstanced endeavors to swing, but her side bears upon one of the cables, which catches on her heel, and interrupts her in the act of traversing. In this position she must ride with her broadside or stern to the wind or current, till one or both of the cables are slackened, so as to sink under the keel; after which the ship will readily yield to the effort of the wind or current.

Girt-line. A rope passing through a single block at the head of a mast to hoist up the rigging; the girt-line is the first rope employed to rig a ship, and the last in unrigging. *Hammock girt-lines*, lines extending from jib-boom to spanker-boom, on which scrubbed hammocks are stopped to dry. *Stripped to a girt-line*, entirely stripped; naked.

Give. To yield to force or pressure.

Give a Spell. See Spell.

Give Chase. To pursue another vessel.

Give her Sheet. To ease off the sheet.

Give the Calf more Rope. An expression conveying an indirect request for silence, addressed to one who is making an unusual or unnecessary noise, which thus is likened to that caused by the uneasiness of the tethered calf.

Give Way. To commence rowing. To row with more vigor. *Give way together*, to pull together. *Give way with a will*, to pull heartily.

Gladene. A very old designation of the sea-onion.

Glance. A dark-colored metallic sulphuret. A name for anthracite coal. See Northern Glance.

Gland. In mechanism, a piece of metal consisting of a cylindrical ring fitted to the annular space between a rod or valve-stem and the interior of its stuffing-box, provided with a flange by which it is secured and adjusted either by bolts and nuts, or by a large nut encompassing the outside of the stuffing-box; its use being to confine and adjust the packing.

Glasag. A certain kind of edible sea-weed.

Glasgow. The commercial and manufacturing capital of Scotland, on both sides of the Clyde, 21 miles from its mouth. Lat. 55° 51′ 52″ N.; lon. 4° 16′ W. When by the union of England and Scotland the trade with the American colonies was thrown open to Scottish enterprise, Glasgow became the centre of the tobacco trade; later it became a great centre of the sugar trade, and this trade the town still retains. Her special business consists of iron-ship building and machine-making, and the Clyde-built steamers and engines are world-renowned. In the beginning of the century, the Clyde below the lowest bridge could be forded on foot, now vessels of 2000 tons can lie at anchor at all states of the tide. An excellent harbor has been constructed in the city on the Forth and Clyde Canal. Pop. 700,000.

Glass. A sailor's name for anything made of glass; as, the barometer, telescope, etc. *How is the glass?* how is the barometer? The *glass* is said to be falling or rising as the mercury falls or rises.

A *time-glass* was formerly employed to mark the flight of time; hence *glass* was used to denote the length of time the sand occupied in running out. *To flog* or *sweat the glass*, to hasten the running of the sand by agitation, or to turn it a short time before the sand is out. Twenty-eight-second and fourteen-second glasses are still used to mark the time in heaving the log. *Clear glass!* To let the sand run out of one end before the chip is hove overboard. *To cook a glass*, to heat it, and thus absorb the moisture collected on it; applied to time-glasses and telescopes. *Night-glass*, a telescope adapted to viewing objects at night; it has a large field of view, and concentrates a large amount of light. *Spy-glass*, a telescope.

Glassok. A name of the say, seath, or coal-fish.

Glasson, John J., Commodore U.S.N. Born in New York City. Appointed midshipman from New York, February 1, 1823; served in the store-ship "Decoy" and schooner "Fox," in the West India Squadron, fitted out by special act of Congress for the suppression of piracy, which was successfully accomplished under the command of Commodore David Porter, 1823; schooner "Grampus," coast of Africa and West Indies, 1824; in the "North Carolina," 74, and sloop "Warren," Mediterranean, 1825–29; sloop "Natchez," West Indies, 1830.

Promoted to passed midshipman, June 4, 1831; revenue-cutter "Rush," as first lieutenant in the Revenue Marine. "New York," 1831–32; schooner "Shark" (as master), Mediterranean, 1833–34; rendezvous, New York, 1835–37.

Commissioned as lieutenant, February 9, 1837; sloops "Lexington" and "Falmouth," in the Pacific, 1838–40; steamer "Fulton," on special service, New York harbor, 1841–42; sloop "Decatur," coast of Africa, 1843–44; store-ship "Lexington," with troops to the coast of Texas, 1845; steamer "Spitfire" (executive) and schooner "Falcon," Home Squadron, 1846–48; commanded the latter vessel in the attack on Vera Cruz, and the Castle of San Juan de Ulloa, which were captured by the joint action of the army and navy; also in the rescue of 121 inhabitants of the town of Valladolid, Yucatan (burned and sacked by the Indians in a state of insurrection), landing them safely at the city of Campeachy.

Commissioned as commander, September 14, 1855; commanding rendezvous, New Bedford, Mass., 1861–63; navy-yard, Norfolk, Va., in charge of stores for the supply of the Coast Squadron in the Atlantic, and the flotilla forces in the Chesapeake, 1864–65.

Commissioned as commodore, September 28, 1866. Sea service, 17 years 11 months; shore or other duty, 8 years 10 months. Retired October 1, 1864.

Glaucus. A genus of nudibranchiate mollusks, found in the warmer latitudes floating in the open sea, beautifully colored with blue.

Glave. A light hand-dart. Also, a sword-blade fixed on the end of a pole.

Glazed Powder. See Powder.

Glent. To turn aside or quit the original direction, as a shot when it impinges on a hard substance.

Glib-gabbet. Smooth and ready speech.

Glim. A light; familiarly used for the eyes. *Douse the glim*, put out, or cover up, the light.

Glisson, O. S., Rear-Admiral U.S.N. Born in Ohio. Appointed midshipman from Indiana, November 1, 1826.

Promoted to passed midshipman, June 4, 1832; in the "Delaware," 74, Mediterranean, 1832–35.

Commissioned as lieutenant, February 9, 1837; sloop "Marion," West India Squadron, 1841–42; sloop "Saratoga," Brazil Squadron, 1843–44; commanding schooner "Reefer," during the Mexican war, 1847; attached to steam-frigate "Powhatan," East India Squadron, and on the Japan Expedition, 1852–55,—was in Japan when the first treaty was made by Commodore M. C. Perry.

Commissioned as commander, September 14, 1855; commanding steamer "Mount Vernon," North Atlantic Blockading Squadron, 1861.

Commissioned as captain, July 16, 1862; while in the "Mount Vernon," saved the transport "Mississippi," bound to New Orleans, with Gen. Butler and 1500 men on board. It was supposed that she was designedly run on Frying-pan Shoal, N. C.; and had it not been for the timely assistance of the "Mount Vernon," it is very probable that many lives would have been lost. By this valuable service being rendered, Gen. Butler was enabled to reach New Orleans in time to participate in that great battle. While on the blockade of Wilmington, he burned a light-boat under the guns of Fort Caswell, so close that they could hear the sentinels calling "all's well." This light-boat was all ready to receive her battery of 8 guns, and would have been put in commission in a few days.

Commanding steam-sloop "Mohican," 1862–63, in chase of the "Alabama"; commanding steamer "Santiago de Cuba," 1864–65; present at the two attacks on Fort Fisher, December, 1864, and January, 1865; commanded the Third Division in both engagements; was recommended by Admiral Porter for promotion for covering the landing of the troops and carrying his division into action.

Commissioned as commodore, July 25, 1866.

Commanding Naval Station, League Island, Pa., 1867, to May 1, 1870.

Commissioned as rear-admiral, June, 1870, and ordered to the command of the European Fleet, where he remained until retired, on January 18, 1871.

Gloaming. The twilight. Also, a gloomy, dull state of the sky.

Globe (Lat. *globus*). A word synonymous with sphere, but generally restricted to mean the earth. An artificial spherical representation of the earth or heavens.

GLOBE-FISH. A fish of the genus *Diodon* or the genus *Tetraodon*, which, by inflating an abdominal sac, can swell out its body to a globular shape.

GLOBE-RANGERS. A sobriquet for marines.

GLOBULAR SAILING. An antiquated term for *spherical sailing*.

Gloucester. A city and port of entry of Essex Co., Mass. It has a greater amount of tonnage employed in domestic fisheries than any other town in the United States, amounting in 1878 to 32,604 tons, the number of vessels being 520, of which 409 were employed in the fisheries. The quantity of mackerel inspected in 1876 was 95,422 barrels. The number of men employed in the cod- and mackerel-fisheries was 5000. In 1875 the fleet landed 9,710,787 pounds of fish. The cod-fishery has been successfully prosecuted for more than a century. In 1876 the number of vessels owned here and employed in the cod-fishery was 375. The total value of the fisheries in 1876 was $4,000,000. The harbor is one of the best on the coast, and is accessible at all seasons to vessels of the largest class. Pop. 17,000.

Glower. To frown upon; to look savagely.

Glue Cement. One pound glue, one pound black resin, quarter-pound red ochre, mixed with the least possible quantity of water.

Glue, Marine. One part india-rubber, twelve parts mineral naphtha or coal-tar; heat gently, mix, and add twenty parts of powdered shellac. Pour on a slab to cool; when used, to be heated to about 250° F.

Glum. Gloomy; low-spirited.

Glut. A piece of wood used as a fulcrum for a lever. A becket attached to the after part of a square-sail, into which is hooked the bunt-whip. Topsails frequently have three gluts, two abaft for furling and one forward for a midship bunt-line used in taking in the last reef.

Glycerine, Nitro-. See EXPLOSIVES.

Gnomon. The hand; style of a dial.

Go-about. To put a ship on the other tack.

Go Ashores. The seaman's best dress.

Gobarto. A large and ravenous fish of early voyagers, probably a shark.

Gobbag. A name for the dog-fish.

Gob-doo. A term for a mussel.

Goblachan. A name for the parr or samlet.

Gob-line, Gob-rope, or Martingale Back-rope. A rope which fits over the dolphin-striker with a cuckold-neck, the ends setting up to the bows; they are frequently made of chain.

Gobon. An old English name for the whiting.

Gob-stick. A horn or wooden spoon.

Goby. A spiny-finned fish allied to the blenny, and distinguished by having the ventral fins on the breast capable of forming a funnel-shaped sucker. Several species of the genus *Gobius* are so called. They are mostly small sea-fishes, and can live for some time out of the water.

Godon, Sylvanus W., Rear-Admiral U.S.N. Born in Pennsylvania. Appointed midshipman from the same State, March 1, 1819.

Commissioned as lieutenant, December 17, 1836; attached to sloop-of-war "Peacock," East India Squadron, 1836–37; and to sloop-of-war "Cyane," Mediterranean Squadron, 1840; attached to bomb-brig "Vesuvius," 1847, at the siege of Vera Cruz; on special duty, 1850; executive-officer of steamer "Susquehanna," East India Squadron, 1851–53.

Promoted to commander, September 14, 1855; commanding sloop-of-war "Mohican," Pacific Squadron, 1860.

Commissioned as captain in 1861, and ordered to command of sloop-of-war "Powhatan," one of the vessels of Dupont's Expedition to Port Royal.

Promoted to commodore, January 2, 1863; on special duty, 1864; commanding steamer "Susquehanna," and Fourth Division of Porter's Squadron, at the two battles of Fort Fisher, in December, 1864, and January, 1865.

Commissioned as rear-admiral, July 25, 1866; commanding South Atlantic Squadron, coast of

Brazil, 1866–67; commandant navy-yard, New York, 1868–70. Retired in 1871, and died May 17, 1879.

Godown. The name given to store-houses and magazines in the East Indies,—a corruption of the Malay gâdong.

Godsend. An unexpected relief or prize; wreckers denote by the term vessels and goods driven on shore.

Goe. A creek smaller than a voe.

Gogar. A serrated worm used for fishing-bait.

Goglet. An earthen vase or bottle for holding water.

Goillear. The Gaelic for a sea-bird of the Hebrides, said to come ashore only in January.

Going Free. Sailing with a wind which allows the yards to be braced in and sheets eased off.

Going Large. Sailing with a wind which permits the stun'sails to be set.

Going through the Fleet. An old method of punishment, long since abolished. The victim was sentenced to receive a certain portion of the flogging alongside the various ships.

Goldeney. A name for the yellow gurnard.

Golden Fleece. Jason, the Argonaut, sailed with his companions from Iolchos to Colchis to avenge the death of his kinsman Phryxus, and to recover his treasures, which the perfidious Æëtes, king of Colchis, had seized, after murdering their owner. The ship in which Phryxus had sailed to Colchis was adorned with the figure of a ram on the poop, which gave occasion to the poets to pretend that the journey of Jason was for the recovery of the golden fleece, 1263 B.C.

Golden Number. The cycle of 19 years, or number which shows the years of the moon's cycle; its invention is ascribed to Meton, of Athens, about 432 B.C. To find the golden number or year of the lunar cycle, add one to the date and divide by nineteen, then the quotient is the number of cycles since Christ, and the remainder is the golden number.

Gold-fish. A small fish of the genus *Cyprinus* (*C. auratus*), so named from its color being like that of gold. It is a native of China, and is said to have been introduced into Europe in 1691. It is often kept in small ponds or glass globes, as an object of curiosity or ornament.

Gold Mohur. A coin in the East Indies varying a little in each presidency, but averaging 15 rupees, or about 8 dollars of our money.

Goldsborough, Charles W., the first chief of the Bureau of Provisions and Clothing, was born at Cambridge, Md., April 18, 1779; died at Washington, December 14, 1843. He was chief clerk of the Navy Department under Stoddart, Smith, and Hamilton, and was secretary of the Navy Board until separate bureaus were established. Author of "U. S. Naval Chronicle" (1824).

Goldsborough, John R., Commodore U.S.N. Born July 2, 1809, in Washington, D. C. Appointed midshipman from District of Columbia, November 6, 1824; previous to which was a cadet-midshipman on board the flag-ship "John Adams," bearing the broad pennant of Commodore David Porter, West India Squadron; attached to the ship-of-the-line "North Carolina," and sloop "Warren," Mediterranean Squadron, from November, 1824, until June, 1830; on board of the "Warren" was engaged in several important operations against the Greek pirates; bombarded the town of Miconi, and at one time, when in command of the launch of the "Warren" with 18 men, engaged, and after a short and spirited engagement, captured the Greek armed piratical schooner "Helene," of 4 guns and 58 men; received the thanks of Capt. Kearney, for the handsome manner in which this service was performed.

Promoted to passed midshipman, April 28, 1832.

Commissioned as lieutenant, September 6, 1837.

Commissioned as commander, September 14, 1855; commanding naval rendezvous, Philadelphia, 1855–59; waiting orders, 1860; commanding steamer "Union," blockading off Charleston, Savannah, and Cape Hatteras, and in Potomac Flotilla, 1861; captured and sank the rebel piratical schooner "York," and bombarded a rebel fort off Mathias Point, Potomac River.

Commissioned as captain, July 16, 1862; commanding steamer "Florida," South Atlantic Blockading Squadron, 1862; at the capture of the city and forts around Fernandina; commanding steam-frigate "Colorado," Western Gulf Blockading Squadron, 1863.

Commissioned as commodore, April 13, 1867. Retired July 2, 1870; died June 22, 1877.

Goldsborough, Louis Malesherbes, Rear-Admiral U.S.N., was born in Washington, D. C., February 18, 1805, and in December, 1812, when less than 8 years of age, an antedated midshipman's warrant was given to him. In July, 1816, he was given his first orders into service, which were to join the "Independence," 74, under Commodore Bainbridge, at Boston.

In 1817 he was ordered to join the "Franklin," 74, destined for the Mediterranean, as the flag-ship of Commodore Stewart; and at the end of this ship's cruise, and while she was at Gibraltar on her way home, he was transferred to the frigate "Guerriere," in which ship he returned to the United States late in the year of 1820.

In 1821 he was again ordered to join the "Franklin," once more the flag-ship of Commodore Stewart, but now bound to the Pacific; and he remained on board of her throughout the cruise.

In 1825 he obtained permission from the Department to avail himself of the schools of Paris, at his own expense, with the view of prosecuting his studies in the French language and in the scientific branches of his profession,—mathematics, astronomy, etc.

In 1827, having received orders from the Department, he joined the Mediterranean Squadron, then commanded by Commodore Rodgers; and after remaining for a while on board the "North Carolina," 74, he was ordered to join the schooner "Porpoise," under command of Lieut.-Commandant Benjamin Cooper. At this period, piratical depredations, in and about the Grecian Archipelago, were of frequent occurrence, so that no merchant vessel, unprotected by a vessel of war, could with safety venture eastward of the island of Malta. In this state of things, the "Porpoise" was kept actively employed in affording convoy from and to Malta and Smyrna. Vessels of war of other nations were also en-

gaged in performing the same service, and a general understanding existed that each would give protection to any merchantman that might ask it, regardless of nationality, as the whole civilized world pronounced pirates enemies of the human race.

In September, 1827, the "Porpoise" left Smyrna for Malta, with a convoy under her charge, consisting of 11 merchant vessels, 5 of which were American; and while becalmed in the Doro passage at night, one of the convoy, an English vessel called the "Comet," was attacked and carried by some 200 or 300 Greek pirates, who had put out from the islands of Andros and Negropont for the purpose, in 5 very large *mysticoes*, or boats, each arranged to pull some 40 or 50 oars. The "Comet," owing to the calm, was at some distance from the "Porpoise" and the rest of the vessels of the convoy perhaps a couple of miles, but in the midst of the noise and confusion on her deck, her mate and another of the crew succeeded in effecting their escape in the stern-boat, reaching the "Porpoise," and imparting all they knew. Although the firing of arms by the pirates as they approached the "Comet" had attracted anxious attention on board the "Porpoise," and put all on the *qui vive*, yet up to the moment of the arrival alongside of the mate, nothing had been distinctly ascertained, although efforts with the sweeps were being made to approach the "Comet." It was soon found, however, that the mysticoes were towing the "Comet" faster away from the "Porpoise" than the latter vessel could be moved by the agency of sweeps, and as the only remaining alternative to recover the "Comet" the boats of the "Porpoise" were now resorted to. They were promptly prepared to assail the pirates, and all of them were placed under Goldsborough's command. All told, they were manned by some 40 officers and men, nor could they possibly accommodate more. The pirates numbered at least 200. Despite, however, of this disparity, the "Comet" was boarded without hesitation, the pirates driven from her deck, and the vessel was thus fully recovered. In the struggle, from 80 to 90 of the pirates were either killed or wounded.

The wardroom steward of the "Porpoise," a mulatto of herculean strength, was one of the expedition, and killed with his own hand no less than 11 of the pirates; while the chief of the horde, with several of his men, was dispatched by the pistol of Lieut. John A. Carr, of Virginia. These pirates were at this time so numerous that no merchant vessel, unprotected by convoy, could venture to thread its course among the islands of the Greek Archipelago with impunity; and so powerful were they, that at one time they succeeded in capturing an Austrian 10-gun man-of-war brig. Our merchant marine suffered heavily by their depredations, for they attacked indiscriminately vessels of every nation except their own. In such a state of affairs, a sound thrashing, like that administered by Lieut. Goldsborough and his little company, could hardly fail of good effect.

In 1830, Goldsborough returned to the United States in the "Delaware," 74, Commodore Crane, as one of her lieutenants, and shortly afterward he brought to the notice of the Department the defectiveness of the implements of navigation—charts, chronometers, sextants, quadrants, etc.—generally furnished to our ships by the process of requisitions upon navy agents, and urged as a remedy the establishment of a depot of charts and instruments, in order that every article might be thoroughly examined and tested before it was issued for use. The suggestion was strongly supported by the Navy Commissioners, and in a little while the depot was under way, with Goldsborough in charge of it. This was the nucleus of the present observatory.

In 1846, war existing with Mexico, he applied to be employed, and was appointed executive-officer of the "Ohio," 74, commanded by Capt. Stringham, and was present on board that ship at the fall of Vera Cruz, and subsequently commanded a large detachment of her officers and crew at the attack and capture of Tuspan.

In 1849 he was ordered by the Department as the senior naval officer of a joint commission, composed of three army and three navy officers, to explore California and Oregon, with the view of ascertaining and reporting upon the advantages they might possess for military and naval purposes, the proper situations for fortifications, dock-yards, light-houses, etc. In 1851 he returned from this service to Washington, and in 1852 he was ordered to command the frigate "Cumberland," and the flag-ship of Commodore Stringham, destined for the Mediterranean. After serving on board of her, in command, for some time, the commander of the "Levant," one of the vessels of the squadron, died, and he (Goldsborough) was ordered to command that vessel; and while on board of her at Constantinople, he received orders to return to the United States to take command of the Naval Academy, and accordingly did so return in October, 1853, and in the following month, November, took command of that establishment, and continued as its superintendent until September, 1857, or nearly four years. In the fall of 1857, he was detailed as one of the Board of Revision in cases which had arisen under the first law of Congress touching officers to be placed on a retired or a reserved list, and subsequently, as the head of a board to revise and rewrite the Book of Ordnance Instructions.

In 1859 he was ordered to command the frigate "Congress," fitting at Philadelphia as the flag-ship of Flag-Officer Joshua R. Sands, appointed commander-in-chief of the Brazil Squadron; and he returned to Boston as the captain of that ship in August, 1861, shortly after the first battle of the Rebellion at Bull Run, when Flag-Officer Sands, having performed his cruise to the entire satisfaction of the government, was, as a matter incident to the non-return of the ship to Brazil, relieved from his position. She, however, was still continued in commission, and in September, or shortly after reaching home, Goldsborough was ordered to proceed with her, under his command, to Hampton Roads, and there report to Flag-Officer Stringham.

On arriving at Hampton Roads, orders from the Department were placed in his hands, by Flag-Officer Stringham, directing him to take command of the North Atlantic Squadron, and thus to relieve Flag-Officer Stringham, who, it was understood, did not desire to be continued in command of it, and had so expressed himself to the Department.

He retained the command of the North Atlantic

Squadron during 1861–62, being promoted to rear-admiral July 16, 1862, and performed his important duties at that most critical period of the war to the entire satisfaction of the Department. In 1863, he was assigned to the very important duty of preparing a code of regulations for the naval service. On completing this work to the full extent he was authorized to proceed, he was then assigned to revise the book of naval allowances in regard to equipment and outfits.

In April, 1865, he was appointed to command the European Squadron, and after serving out his full time in this command, he was relieved from it by the appointment of Admiral Farragut to take the position, and therefore returned to the United States in his flag-ship "Colorado" in August, 1867. Special duty in Washington, 1867 to the date of his death, February 20, 1877.

Gold-sinny. A small fish, the *Crenilabrus Norwegicus.*

Gomer. A form of chamber in ordnance consisting in a conical narrowing of the bore towards its inner end. It was first devised for the service of mortars, and named after its inventor, Gomer. See CHAMBER.

Gomeisa. The name of the star β *Canis Minoris.*

Gomere (*Fr.*). The cable of a galley.

Gondola. A light pleasure-barge used on the canals of Venice, generally propelled by one man standing at the stern with one powerful oar, though the largest kind have two or more rowers. The medium-sized gondolas are about 30 feet long and 4 feet broad, with a well-furnished cabin amidships, though exclusively black, as restricted by law. They rise at each end to a very sharp point about the height of a man's breast. The stem is always surmounted by the ferro, a bright iron beak or cleaver of one uniform shape, seemingly derived from the ancient Romans, being the *rostrique tridentibus* of Virgil. Also, a passage-boat of 6 or 8 oars, used on other parts of the coast of Italy. The name is also applied to canal-boats having the bow and stern alike.

GONDOLIER. A man who works or navigates a gondola.

Gone. Carried away; parted; broken.

Gone-goose. A ship deserted or given up in despair.

Gong. A kind of Chinese cymbal, with a powerful and sonorous tone produced by the vibrations of its metal, consisting mainly of copper and tutenag or zinc; it is used as a signal for calling away the riflemen; in vessels without field-music it is used to summon the crew to quarters.

Gonga. A general name for a river in India, whence comes Ganges.

Good-at-all-points. Practical in every particular.

Good-conduct Badge. See BADGE.

Good Shoaling. An approach to the shore by very gradual soundings.

Goole. An old term for a breach in a sea-bank.

Goosander. The *Mergus merganser*, a sea-fowl, allied to the duck, with a straight, narrow, and serrated bill, hooked at the point.

Goose-neck. A sort of iron hook fitted on the inner end of a boom, and introduced into a clamp of iron or eye-bolt, so that it may be unhooked at pleasure.

Goose-wing. The clew of a course or topsail when the middle part is hauled up and lashed to the yard; this is done in very bad weather only. The term is also applied to the sails of a schooner running before the wind with the sails wing-and-wing.

Gorab. See GRAB.

Goramy. A fish of the family *Anabasidæ*, a native of China and the Eastern Archipelago. It is one of the nest-building fishes, and at the breeding season forms its nest by entangling the stems and leaves of aquatic grasses.

Gord. An archaism denoting a deep hole in a river.

Gore. A triangular piece of cloth or canvas set in to enlarge a garment or sail at a particular point. To cut in the form of a gore.

GORING-CLOTHS. That part of a sail cut on the bias to give the required sweep.

Gorge. The groove in a sheave.

Gorgon Steam-engine. A form of direct-acting vertical cylinder steam-engine, invented by Seaward, as a means of obviating the use of the beam in marine engines. It is called the "Gorgon" engine from having been first employed in an English government steamer of that name.

Gormaw. A name for the cormorant.

Gorse. Heath or furze for breaming a ship's bottom.

Gosnold, Bartholomew. Near the close of the reign of Queen Elizabeth this navigator crossed the Atlantic, and in seven weeks reached the bay of Massachusetts. Turning to the south he discovered a promontory, to which he gave the name of Cape Cod from the abundance of cod-fish found there. Gosnold then proceeded to take possession of other islands, to which he gave the names of "Martha's Vineyard" and "Elizabeth."

Gosport. A fortified seaport town of England, separated from Portsmouth by the mouth of Portsmouth harbor. Pop. 7500, mostly engaged in the government navy-works, and in the supply of shipping. Gosport has extensive barracks, the Royal Clarence victualing-yard, a powder-magazine and iron-foundries. Outside of the town on the south is Haslar Hospital, a naval infirmary.

Gossoon. A silly, awkward lout.

Gothenburg. A seaport city of Sweden, at the head of a fiord of the Cattegat, which receives the Götha River. The harbor, defended by three forts, has 20 feet of water, and a grand dry-dock cut in solid rock. Pop. 69,000.

Gouge. An unwarrantable proceeding which inures to the injury of another; a cheat. A reprehensible practice, sometimes indulged in at the Naval Academy, of using concealed bits of paper, etc., as aids to the memory in making a recitation; also, the article so used. Gouging is equivalent to *ponying* or *papering.*

Gougings. Gudgeons.

Goulet. Any narrow entrance to a creek or harbor; as, the goletta at Tunis.

Gouries. The garbage of salmon.

Government, Naval, may be defined as that system of fundamental rules by which a navy is governed. The chief desideratum is that the rules shall be so framed as to insure an energetic, efficient, and economical management of the affairs of a navy. These rules may have either

the sanction of custom or the authority of law. In either event they partake of the character of the government under which they are framed. In England, for example, the supreme power is divided into two branches: the Parliament, consisting of the Crown, Lords, and Commons; and the Executive, consisting of the sovereign alone. Thus the executive forms a co-ordinate part of the legislative branch. It is not surprising then to find that the privy councillors, or members of the cabinet, have seats in one or the other of the two houses of Parliament. The First Lord of the Admiralty has the opportunity, therefore, as a member of Parliament, of presenting the navy estimates himself, and, at the same time, of explaining the naval policy of the administration, and of answering such questions and meeting such objections as may be offered. Besides the First Lord there is a civil lord, who also is a member of Parliament, and a Parliamentary or Financial Secretary. This intimate relationship between the executive and the legislative branches of the government goes far towards insuring harmony of action between the two, and greatly facilitates the transaction of public business. The five lords and the Parliamentary Secretary change with the ministry, so that not only the government but the Navy Department is always in accord with Parliament. The average duration of a ministry, taking the last 150 years, is about three years and eight months. These changes affect the navy at large but little, however, as the greater part of the work of the Admiralty is distributed among heads of departments (in a manner somewhat analogous to the distribution of duties among the chiefs of bureaus of the United States Navy Department), who are quite independent of party politics.

While the First Lord is directly responsible to Parliament and controls the navy as a whole, the Senior Sea Lord, under his authority, directs the movements of the fleet, and is responsible to him for its discipline. He is commander-in-chief, as it were, of all the floating force; or, in military phrase, the adjutant-general to the First Lord, relieving him of those purely professional duties which the civilian frequently finds so difficult to master. The proof of the efficiency of this form of naval government may be found in the fact of its having stood the test, during nearly two centuries, of great wars, wherein the naval resources of the country have been strained to their utmost, and of its having successfully resisted a formidable combination, in 1861, to abolish it.

To the foregoing the naval administration of the United States presents some points of strong contrast.

By the act of September 2, 1789, establishing a Treasury Department, the Congress of the United States provided that the Secretary of that Department might be "required to give information to either branch of the legislature *in person* or in writing . . . respecting all matters pertaining to his office." This is the only instance, it is believed, under the laws of the United States, where a member of the executive branch of the government could be permitted, in the prosecution of public business, to raise his voice in the legislative halls; but so foreign is such a proceeding to the genius of the Constitution, that the provision relating to personal explanations has become a dead letter. This complete separation between the executive and legislative branches leaves a hiatus between the two which, however desirable in theory, tends but little to accelerate the dispatch of public business, and renders a definite line of naval policy practically impossible.

In the organization of the Navy Department of the United States there is a Secretary of the Navy appointed from civil life. The law permits him to distribute the duties of the Department among eight bureaus, very much as it is in the fixed administration of the English navy; but it provides him with no professional assistant to occupy towards him the relative position the Senior Sea Lord bears towards the First Lord of the Admiralty; consequently much of the duty pertaining to that very important office is imperfectly performed, or not performed at all,—there is no one to whom it legitimately belongs.

The proof of the inefficiency of this form of naval government is to be found in the fact that it utterly failed to stand the test of war. The foregoing will serve to illustrate the principle of naval administration. For further information, see ADMINISTRATION and ADMIRALTY.—*S. B. Luce, Captain U.S.N.*

Governor. A machine for regulating the speed of a prime mover, such as a steam-engine, water-wheel, or windmill, by automatically controlling the quantity of steam admitted to a steam-cylinder, or the supply of water to a wheel, or by feathering or reefing the sails of a windmill. There is a great variety of types and devices in use, but the original invention is attributed to Watt. Among these is the type of "ball-governor," or revolving pendulum, which consists of two suspended balls, the centrifugal force of which widens their amplitude as the speed is increased, and gravity or the force of springs diminishes it as the speed decreases; the motion due to the varying position of the planes in which the balls revolve being communicated to the throttle, sluice-valve, or other mechanism, by means of a sleeve on the spindle or a rod within it, and requisite rods and levers. Other devices consist, in principle, of obliquely placed blades or vanes revolving in a liquid or in the atmosphere, and producing an axial motion with variation of speed; and again, others depend upon the moment of inertia of a heavy wheel, which, by suitable mechanism, either actuates the throttle-valve directly, or by the intervention of a small steam and hydraulic cylinder. In some marine steam-governors the action depends upon the head of water due to the variable immersion of the screw-propeller in a sea-way; and both mechanical and electrical contrivances are used. Marine governors thus far have met with but limited success.

Gow. An old term for the gull.

Gowk. The cuckoo. A stupid, good-natured fellow.

GOWK-STORM. A late vernal equinoctial gale, contemporary with the gowk or cuckoo.

Goylir. A small sea-bird whose appearance is said to precede a storm; hence seamen call them *malifiges*.

Grab. The large coasting-vessel of India, generally with two masts and of 150 to 300 tons burden. It drew but little water, and had a projecting prow covered with a strong deck on a

level with the main deck of the vessel, from which it was separated by a bulkhead that terminated the forecastle. It was armed with guns varying in calibre from 6- to 12-pounders.

Grabble. To endeavor to hook a sunken article. To catch fish by hand in a brook.

Grade. See Rank.

Graft. To cover a ring-bolt, strap of a block, etc., with a weaving of fishing-line or log-line. In early days the strap of a block was frequently *grafted* instead of being spliced; the ends of the strap were joined as for splicing, the strands were opened out and laid up into nettles, and the nettles were grafted over the opposite part.

Grain. In the transverse section of a tree two different grains are seen; that running in a circular manner is termed the *silver* grain; the other radiates from the centre, and is called the *bastard* grain. *Grain* is also a name applied to a whirlwind in Normandy; it is transitory in its nature, and is accompanied by rain. *Bad-grain*, a sea-lawyer; a nuisance. *In the grain of*, in the wake of. A mast is said to have its grain *upset* when it suffers an injury by compression,—frequently due to too much setting up of the rigging.

Grained Powder. See Powder.

Grains. A large fish-spear with several prongs.

Gram. A species of pulse given to horses, sheep, and oxen in the East Indies, and supplied to ships for feeding live-stock.

Grampus (Fr. *grampoise*, a corruption of *grand poisson*). An animal of the cetacean or whale tribe, distinguished by the large pointed teeth with which both jaws are armed, and by the high falcate dorsal fin. It generally attains a length of 20 to 25 feet, and is very active and voracious.

Grampus, Blowing the. Sluicing a person with water, especially practiced on him who skulks or sleeps on his watch.

Grandsire. The name of a four oared boat which belonged to Peter the Great, now carefully preserved at St. Petersburg as the origin of the Russian fleet.

Granny's-bend. The slippery hitch made by a lubber.

Granny-knot. This is a term of derision when a reef-knot is crossed the wrong way, so as to be insecure. It is the natural knot tied by women or landsmen, and derided by seamen because it cannot be untied when it is jammed.

Grape, or Grape-shot. Grape-shot consists of a circular cast-iron stand of the proper dimensions, having an upright spindle in the centre, around which balls are placed and held in position by a stout canvas covering, the lower edge of which is secured to a circular plate by a strong seizing, and quilted over the balls by marline, the upper edge of the canvas being drawn in and secured to the upper part of the spindle. It is then painted as a protection against dampness, the balls and stand being well coated with red lead before being made up. To the top of the spindle a shackle or handle is fixed to facilitate handling.

Grape-shot have not sufficient penetration to be used with effect, generally, against ships-of-war beyond 150 yards. When the men on the spar-decks of the enemy are exposed by the heeling of the ship, grape or canister may be used against them at distances varying from 200 to 300 yards. Against light vessels, a single stand of grape from heavy guns may be used at about 400 yards. The dispersion of the balls is about one-tenth the distance, and is practically independent of the charge.

Grapnel, or Grappling. A pronged implement used as an anchor for a boat; for the purpose of recovering an object at the bottom of a harbor; for hooking on to ropes, etc., likely to foul the screw; for securing one vessel to another when boarding is to be attempted; or to make fast a tow-line to a burning vessel, etc.

Grapnel-rope. The rope bent to a grapnel. It is sometimes fitted with a length of chain for towing ships on fire, in order that it may not be burnt off.

Grapple. To seize; to hook with a grapnel.

Grappling. See Grapnel.

Grasp, Death-. The convulsive clutch of a drowning person. See Drown.

Grass Combers. A galley-term for landsmen who enter the naval service from the rural districts. Many of them make good seamen.

Grate. A floor or platform consisting of bars of iron or other material, separated one from another so as to allow a vacant space between. Used in steam-boiler and other furnaces for supporting the bed of burning fuel while permitting free access of air thereto.

Grate-bar. One of a number of bars composing a furnace-grate.

Gratings. Lattice-work made of ash to cover the hatchways, etc.

Grating-deck. A light movable deck made of gratings.

Grave. To clean a vessel's bottom, and pay it over.

Graving Beach, or Slip. The portion of a dock-yard where ships were placed to be graved.

Graving-dock. See Dock.

Gravel. To vex; to irritate; to mortify.

Gravelin. A small migratory fish supposed to be the spawn of the salmon.

Gravitation (Lat. *gravis*, heavy). A term used to denote that mutual tendency which all the bodies of nature have to approach each other, with forces which are directly as their masses, and inversely proportional to the squares of their distances. This mutual tendency of all the particles of matter to each other is called the *attraction of gravitation*. In reference to any particular body or mass of matter the aggregate attraction of all its particles is usually called simply its *gravity*. *Absolute gravity*, that by which a body descends freely in a vacuum. *Relative gravity*, that by which a body descends when the absolute gravity is opposed by a constant but inferior force, such as in the descent of inclined planes, or in resisting mediums, as air and water. *Specific gravity*, the ratio of the weight of a body to the weight of an equal volume of some other body assumed as a conventional standard. The standard usually adopted for this purpose is pure distilled water at a given temperature. See Centre of Gravity.

Grawls. The young salmon. See Grilse.

Gray-fish, Gray-lord. Names given to the coal-fish, *Gadus carbonarius*.

Grayle. Sand; small gravel.

Grayling. A fish of the salmon kind (*Thymallus vulgaris*), inhabiting many of the streams of England, and also found in Norway and Sweden.

Grayning. A species of dace.

Gray-school. A particular shoal of large salmon in the Solway in July.

Graze. To rub or touch lightly in passing over.

Greasy Weather. Dirty, disagreeable weather.

Great Britain, Navy of. If any reliance could be placed on tradition, the credit of originating a navy for the defense of the coasts of England would be assigned to Alfred the Great. There is no doubt that, at all times subsequently, fleets of small craft were maintained for the national protection, but it does not appear, from authentic records extant, that any large ships were built for warlike purposes until the reign of Henry VII., when a two-decked vessel—the first of the kind—was launched in the year 1488, and received the appellation of the "Great Harry." Still, nothing in the form of a regular royal navy was established until Henry VIII. ascended the throne. Three years after his accession, England was involved in a war with France, and steps were taken to invade that country. A fleet was equipped for the purpose. The French were prepared, and a battle—the first sea-fight in which cannon were employed—took place off Brest on the 10th August, 1512. The action was indecisive, and the fleets returned to their respective harbors. In the following year a similar expedition was sent against Brest. The French resisted it with galleys. Sir Edward Howard, the lord high admiral, was killed in the action. Henry now set to work vigorously in the constitution of a royal navy. A large three-decked man-of-war was constructed, and called the "Henri, Grace de Dieu," which name was afterwards changed to that of the "Edward." Fifty-eight other vessels were built, the tonnage of which ranged from 80 to 1200. For the proper government of the navy, Henry VIII. established an admiralty and a navy office, and Sir Thomas Howard was appointed lord high admiral, in succession to his brother. For close combat, muskets, hackbuts, and matchlocks were introduced in 1514.

The war with France having come to a close, we read of no more sea-fights until 1523, when the treaty was broken, and an English fleet attacked and took possession of Boulogne. Continual actions were fought without striking results, while the French galleys and the English *pinnaces*, then used for the first time, kept up a sort of desultory guerrilla warfare. In the mean time King Henry persevered in his plans, and established dock-yards at Deptford, Woolwich, and Portsmouth. He made laws for the planting and preservation of trees, that timber might always be available for ship-building. Further, he assigned regular pay to the officers and sailors, which contributed to render the service very popular.

Edward VI., who succeeded to the throne on the death of Henry VIII., was a peaceable monarch, and devoted his resources to scientific objects. He engaged the services of Sebastian Cabot, and sanctioned an attempt, under Sir Hugh Willoughby, to open a way to India and China in a northwest direction. Queen Mary, who succeeded Edward, did not follow up his measures for the perfection of naval efficiency, doubtless influenced by her husband, Philip of Spain, who desired to cripple a service that might become formidable to his own country. But Queen Elizabeth, who knew that the only way to protect the shores and commerce of England was to be prepared for war, proceeded soon after her accession to repair the neglects of her predecessor. She continued the construction of men-of-war, fortified the banks of the Medway, in Kent, which was the rendezvous of the ships, encouraged the manufacture of gunpowder, and established arsenals in the chief sea-board cities. The merchants followed the queen's example, and by the time she had occupied the throne for four years as many as 20,000 seamen were available to man the ships of war. The country was at peace, and opportunity was therefore given for a further prosecution of the endeavor to effect discoveries and acquire distant possessions. The annexation of Virginia (America) and other places was the result. But the state of peace was not permanent. A religious war between Protestants and Catholics had been waging for many years, and Elizabeth giving countenance to the Dutch Protestants, afforded Philip of Spain a pretext for sending an "Armada" of 130 fine war-ships and innumerable transports against England. The year 1587 saw the approach of the Armada and its complete destruction, partly by the British vessels, which met isolated Spanish ships and gave them battle, and partly by a furious storm, which dispersed the expedition. This victory and an attack upon Cadiz, Philip's greatest seaport, completed the warlike operations of the navy during the 16th century. The queen was fortunate in her admirals. The names of Howard of Effingham, Francis Drake, Frobisher, and Hawkins adorn the page of England's naval history. Those gallant men were all lost to the nation towards the close of Elizabeth's reign. Frobisher was killed in an attempt to recover Brest from the Spaniards, and Drake and Hawkins died in India.

Not until the middle of the 16th century did anything occur to give active employment to the navy. Meanwhile, a third big ship was built, and armed with 100 guns of divers calibre. At the same time the classification of ships by *rates* and *guns* was begun. In 1652, Oliver Cromwell being then at the head of affairs, war was declared between England and Holland. It arose from the habitual refusal of the Dutch, under Van Tromp, to lower their flag to the British. Gens. Blake, Monk, and Deane were appointed to lead the English squadrons, and they were opposed by Admirals De Ruyter, Van Tromp, and De Witt. On the 3d of June, 1653, the rival fleets met for the first time *in line*. After several fights the Dutch were compelled to retreat to the Texel. The loss on both sides was very heavy, and Holland and England again shook hands. Two years later (1653) Blake was dispatched to the coast of Morocco to punish the African marauders, who had plundered and imprisoned British subjects. He attacked and destroyed the fortifications of Tunis, then proceeded to Algiers and Tripoli and rescued the captive English, exacting compensation from the Moors for the injuries inflicted. In 1657, war having been declared with Spain, Blake was sent to Cadiz, thence to Santa Cruz, to capture sundry Spanish galleons with gold on board. While on this service he died.

Cromwell left the country in peace when he died. His successor, Charles II., maintained amicable relations with foreign powers until 1665, when war was proclaimed with Holland by the government of Charles II. A large fleet, under the nominal command of the king's brother, the Duke of York, met an equally powerful force under Opdam, and in the engagement which took place the evolution called "breaking the line" was first adopted, and proved a success. The Dutch were defeated; but in the following year De Ruyter took the field in command of the Dutch, and a series of actions ensued, in which the Dutch were masters. The peace of Breda was the consequence. In 1667, the Dutch and the French, while the peace was being negotiated, were aggressive in the West Indies. Thither Sir J. Harman sailed with a sufficient force, and routed the enemy off the island of St. Christopher, at the same time destroying many of their ships. This led to a rupture of the treaty. Charles having listened to the suggestions of his ministers in favor of a false economy, had dismantled many of his ships and discharged the crews. De Ruyter, being apprised of the fact, immediately crossed to England with 70 ships. Sir Edward Spragge confronted him at the mouth of the Thames, and endeavored to defend Sheerness, but the inferiority of the force at his command rendered his efforts unavailing. De Ruyter pushed on, and entered the Medway, where some ships were at anchor. These he destroyed with fire-ships, which were thenceforth used by the English in kindred operations. Subsequently, allied with the French under Count d'Estrées, an English squadron commanded by Sir Edward Spragge gave battle to De Ruyter, Von Tromp, and Von Ghirt. The losses were great on both sides. De Ruyter was wounded and Von Ghirt killed.

In 1685, Charles II. died, and having no legitimate offspring, was succeeded by his brother James. The latter endeavored to restore popery throughout the kingdom, and in the prosecution of this religious object he received aid and countenance from the French king, Louis XIV. The Protestants of the realm, however, opposed themselves vigorously to the attempt to reconvert the country to Catholicism, and ultimately King James was obliged, in 1688, to abdicate the throne, giving place to the Prince of Orange, who had married his daughter. Two years later, however, aided by the French and the Irish Catholics, James tried to regain the crown of England. The land forces of both parties came into collision, in 1690, on the banks of the river Boyne, and James's friends succumbed to the resolute valor of his successor, William III. The French, however, under Tourville, gained a triumph over the combined Dutch and English fleet off Beachy Head, which brought Admiral Torrington into great disgrace. Undismayed by the failure of the Catholic forces on the Boyne water, the king of France equipped an immense naval and military force to invade England and restore James. To check this invasion Admiral Russell sailed with a fleet of 60 ships, carrying 4504 guns and 27,725 men, to which armament 36 Dutch ships were added. The opposing forces met off Cape La Hogue in the month of May, 1692. The contest which ensued lasted four days, and terminated with the destruction of the French fleet. Great joy was manifested by the English people when the news of the victory was proclaimed; and in the absence of King William, his queen (Mary) founded a royal naval hospital at Greenwich, near London, as a memorial of the gratitude of the nation for the blessing vouchsafed it by the Almighty.

After the victory at Cape La Hogue the navy ceased for a time to be formidable. It is on record that no fewer than 50 ships were captured by foreign foes down to 1697. King William, however, rapidly repaired the loss, for it appears that before his death he had built 30 large ships, and incorporated into the navy 15 that had been taken from the French. Queen Anne, his successor, continued the improvement of the national sea force to such an extent that when she died and the elector of Hanover ascended the throne as George I., no fewer than 178 ships of war constituted the navy of England. Of that number, 7 of the highest class or rate carried 100 guns each, the remainder had 20 to 90 pieces of ordnance, according to their size. There were six different classes of ships, ranging from 374 to 1869 tons each. The larger were rated as "line-of-battle ships," the lesser as *frigates*, from the Italian word *frigata*, a term used to designate certain long vessels of one deck only which swarmed in the Mediterranean and were propelled by oars and sails. The chief defect in all this armament lay in the disproportion of guns to tonnage. The scientific officers of the day were mistaken in their computation of the carrying facility of the ships. All the guns were nearly of the same calibre. It ought not to be forgotten that early in the reign of Anne Gibraltar was taken from the Spaniards, and remains a British stronghold to this day.

There was neither scope nor occasion for the employment of the navy in the reign of the first George. His successor, being of a more chivalrous temperament, espoused the cause of the queen of Hungary, whose territory was menaced by France, Saxony, Prussia, and Bavaria. The land force contributed by Great Britain failed in its efforts to sustain the queen. Advantage was taken of this circumstance by France to assert the pretensions of the son of James II. to the throne of England, and for their enforcement a military force under Count Saxe, and 20 ships of the line under the command of the Duke de Roquefeuille, attempted to effect a landing on the shores of Britain. The expedition was driven back by Sir John Norris and a naval squadron. Especially unfortunate with her army in the Netherlands, where she lost the battle of Fontenoy, England countered her ill luck by the successes of the navy. Admirals Rowley and Warren upheld her consequence, and Louisbourg was taken from the French. At a later period France endeavored to recover Cape Breton, and made a descent on the British colonial possessions in America, at the same time commencing operations against those in India. The French fleets were met by Admirals Anson and Warren, defeated and captured, while Commodore Fox, with 6 ships of war, made prizes of 40 merchantmen bound for St. Domingo. These successes were crowned by Lord Hawke's capture of 7 ships of the line and several frigates off Brest.

The failure of his naval commanders made Louis XIV. desirous of peace. Great Britain,

nothing loth, accepted the proffered terms, and a suspension of arms took place in 1798. But, not long afterwards, the French endeavored to dispossess the settlers in Nova Scotia of their acquired property, and the dormant warfare was renewed (1756), and continued in America for several years. As before, the land operations of the English were not triumphant, while at sea, as usual, they maintained their reputation. One blot, however, temporarily shocked the national sense. The French made an attempt upon the island of Minorca, then held by the English. Admiral Byng, with a squadron, was deputed to raise the siege. He failed in this, and did not even manage to increase the strength of the beleaguered garrison or replenish its stores. For his neglect and asserted pusillanimity Byng was tried by court-martial and shot. Ultimately the French were expelled from Canada. They made an attempt to recover Quebec, and were frustrated by Lord Colville and a squadron of ships of war. About the same time Commodore More and a small military force took Guadaloupe.

On the accession of George III. (1760), certain propositions were made by France in relation to Spain, which Mr. Pitt, the prime minister, construed into an offense to the dignity of England. War with Spain was the issue of the negotiations. France and Spain, united, then made war on Portugal, and directed their hostile measures to Oporto and Lisbon, two ports of great importance to the military and commercial interests of England. The Portuguese and British land forces, however, defeated the project, and the latter, in retaliation, took possession of several of the French West India Islands, and of the city of Havana, in Cuba. About the same time the "Active" and "Favorite," British men-of-war, captured the Spanish register ship the "Hermione," with prize worth three million sterling on board. In the same year (1762) Manilla was wrested from Spain, and the frigates "Argo" and "Rantler" seized a galleon with a million and a half of treasure on board. A truce followed upon these affairs in 1763, and lasted until A.D. 1770, when a temporary misunderstanding occurred between a Spanish and English man-of-war at Port Egmont, on the Falkland Islands.

Naval operations of every kind were suspended after that affair until 1776, when the North American colonies declared their independence of Great Britain. The French people taking part with the revolted States, British ships of war were sent to capture certain islands in the West Indies. Admiral Byron, in command of the fleet, was opposed by Count d'Estaing, who proved too powerful for the English. On the other hand, Admirals Hyde Parker and Rowley repaired the English failures by disturbing French commerce with the islands. Still, it was very apparent to the British Parliament that the navy had deteriorated and required reform and strength. Vigorous efforts were accordingly decreed, and in 1778, Admiral Keppel, assisted by Sir R. Haviland and Sir Hugh Palliser, cruised in the Channel to protect the trade of the country, while Admiral Byron proceeded to America. After two or three isolated combats between the "Arethusa" and "La Belle Poule," the "America" and the "Licorne," which caused the British vessels to approach closely to the French coast, it was discovered (off Brest) that the French were in great force. A fight ensued, lasting three or four days, and the French getting away in safety, serious disputes arose between the admirals, Palliser bringing charges against Keppel which led to his being tried by court-martial. Keppel was honorably acquitted, but the Admiralty Board continuing to discountenance him, Lord Howe and two other admirals resigned, and 20 captains declared their readiness to do the same, but were deterred by the possibility of their services being required. Spain and France were again in alliance. About this time, carronades (so called from the locality of the foundry on the banks of the river Carron, in Scotland) were introduced into the navy, the better to adapt the weight of the metal to the tonnage of the shipping. They proved effective in two actions,—in one of which the "Hébé" was captured and used as a model for English frigates. The number of ships in the service at this date was 300 of all classes, and with this force, available for active service, Admirals Rodney and Hyde Parker made vigorous war upon the allies, gaining many advantages in the West Indies and on the coasts of Spain and Portugal. The Spaniards used great efforts to recover Gibraltar, but Rodney kept the garrison so well supplied that their exertions proved perfectly futile. A new enemy now arose to tax British strength. The States-General of Holland declared for the Americans, and put the navy to some trouble in 1780. Two years later, England was more fortunate, for Rodney defeated the Count de Grasse in an action of fleets, and took the count a prisoner to England, where he was treated with marked consideration. The fight took place off Dominica, and was a fair test of the relative powers of the rival navies.

From 1780 until 1793 the state of affairs in Europe did not call for much activity on the part of the navy, but after the latter date until 1814, revolutionary France and the Emperor Napoleon compelled it to "rule the waves." With few reverses, it swept the navies of France, Spain, and Holland off the seas. Its principal exploits will be found recorded in the brief biographies of Nelson, Howe, Jervis, Collingwood, Cochrane, Cockburn, etc. The capture or cession of the Cape of Good Hope, Ceylon, Cochin and Malacca, etc., are mainly due to its efforts. It was likewise partially engaged in conflicts with the American navy, but without acquiring a superiority.

No particular change took place in the constitution of the navy for many years after the establishment of peace with France; its employment was limited to an association with the land forces in acquiring influence and position in Burmah, China, New Zealand, etc. But the introduction of steam and the screw as elements in propulsion, and the application of breech-loading cannon to the defense of ships, and their offensive faculty, compelled the adoption of a system of armor-plating and the construction of iron vessels of prodigious magnitude. Turrets, forming a kind of floating fortresses, and rams for cutting the hull of a hostile ship at close quarters, likewise came rapidly into use after the commencement of the American civil war in 1861, in which, however, England took no part,

and now the sailing-vessel is gradually becoming a thing of the past. The last operations of the British navy which claim a place in its brilliant annals occurred in the Black Sea, in 1855–56, when a war was undertaken, in conjunction with France and Turkey, against the empire of Russia, and again in 1877–78, when a demonstration was made in the same locality to force the acceptance of terms of peace on the part of Russia again assailing Turkey in Europe and Asia.

The British navy is necessarily the most powerful, and therefore the most costly, in the world. For the current year, the estimate for the expense of the permanent establishment, the contingencies arising out of its employment, and the continued improvements in nautical architecture and gunnery, reaches nearly $55,000,000. For the protection of so many distant possessions, and of the commerce of the country with all nations, numerous vessels of the highest class are essential, and their equipment corresponds with their bulk and faculty of offense and defense. According to the latest navy lists there are about 400 vessels of all types, and of an aggregate tonnage of 900,000. Of these, 58 are armored vessels carrying rifled guns of great calibre, and protected by armor varying in thickness from 4½ to 24 inches. The number of men employed on board the ships in the navy varies, of course, with the exigencies of the service. Not all the vessels are in "commission" at the same time; but they can be placed on a war footing at very short notice, because there is a reserve force comprehending some thousands of seamen who are continually undergoing drill in the principal harbors. The establishment of officers is permanent, and consists of 3 admirals of the fleet, 16 admirals, 19 vice-admirals, 31 rear-admirals, 173 captains, 208 commanders, 840 lieutenants, 230 sub-lieutenants, 217 midshipmen, 264 naval cadets, 11 staff-captains, 94 staff-commanders, 56 navigating lieutenants and 29 sub-navigating lieutenants, 5 chief inspectors of machinery, 5 inspectors, 180 chief engineers, 355 engineers, 120 assistant engineers, 106 chaplains, 23 naval instructors (who may act at the same time as chaplains), 478 medical officers of different ranks and grades, 225 paymasters and 200 assistants, and 54 secretaries to flag-officers. The naval reserv officers are 400 in number. Serving on board the ships or on shore, as occasion may require, there is in addition to the purely naval establishment a large body of royal marines, a highly effective corps at all times. The marine artillery has 90 officers, and the light infantry 19 colonels, 24 majors, 81 captains, and 135 lieutenants.

The government and direction of the affairs of the British navy are vested in a board denominated the Lords of the Admiralty. The first lord is usually a civilian and a member of the cabinet; two of the others are naval lords, selected from experienced officers capable of estimating the wants and judging of the capability of the force. The patronage is divided among these lords; but this only extends to selections for particular services and the appointment to certain ships. The promotion from rank to rank is regulated by the seniority of the officers; the gradation can only be interrupted by the sentence of a court-martial for acts of indiscipline and the pleasure of the sovereign, who may visit misconduct either by dismissal from the service or by placing an offender at the bottom of the list. All the honors of the Bath, the orders of St. Michael and St. George, the Victoria Cross, the Albert and War medals, are available equally to the navy and the army, and special pensions are conferred for good service in war or peace. Pensions for wounds received in action and to the widows of officers are likewise granted, while the sailors who have served long and commendably are provided for on a similar system, and on a scale commensurate with the position they held in the service.—*J. H. Siddons.*

Great Circle. See CIRCLE.

GREAT-CIRCLE SAILING. In great-circle sailing, the ship keeps on the great circle which passes through the place of departure and the place of destination. This is the shortest distance between the two places, and the ship steers for her port as if it were in sight. As the great circle, except in the cases of a meridian and the equator, does not make a constant angle with the meridians, in order to keep on it, a ship must be continually changing her course. This is practically impossible, and hence what is called *approximate great-circle sailing* is more or less adopted. In approximate great-circle sailing, several points on the arc of the great circle joining the place left and the place sought, are fixed upon, and each of these made in succession by the ship sailing on the rhumb-lines connecting them. The sum of the distances described on these several courses, if the points are not taken too far apart, will not differ much from the shortest distance.

Great Guns. A term for heavy ordnance, excluding mortars and howitzers. *Blowing great guns*, blowing violently.

Great-line Fishing. Fishing carried on over the deeper banks of the ocean. Hand-fishing in over 60 fathoms.

Great Ocean. The Pacific.

Great Shakes. See SHAKE.

Grebe. A genus of birds of the family *Colymbidæ*, with short wings and no tail. On land their motions are awkward, but in the water they are very agile. They are said to take their young under their wings and dive to escape an enemy.

Grecale. A northeast breeze off the coast of Sicily,—Greece bearing N.E.

Greece, Navy of. This small state, protected as it is by the more powerful states of Europe, has had little occasion for a navy since it became a monarchy, nor is it in a condition to support a large armed force. Nevertheless a fleet is maintained for the protection of the commerce of the Morea and the isles, consisting of 16 vessels. Two of the vessels are ironclad, the "Olga" and the "Georgius," besides which there are 1 screw-corvette, 5 yachts, 1 screw-gunboat, and 7 pinnaces and small gunboats. The sailors required for this small armament are obtained by conscription. They are in number 581, with 71 commissioned officers.

Greek Alphabet. The small letters of the Greek alphabet are used to distinguish the different stars of the constellations; thus the star Dubhe is *α Ursæ Majoris*, Rigel is *β Orionis.* The navigator should not, therefore, be ignorant of these characters:—

α Alpha (a).	ν Nu (n).
β Beta (b).	ξ Xi (x).
γ Gamma (g).	ο Omīcron (ŏ).
δ Delta (d).	π Pi (p).
ε Epsīlon (ĕ).	ρ Rho (r).
ζ Zeta (z).	σ Sigma (s).
η Eta (ē).	τ Tau (t).
θ Theta (th).	υ Upsīlon (u).
ι Iōta (i).	φ Phi (ph).
κ Kappa (k).	χ Chi (ch).
λ Lambda (l).	ψ Psi (ps).
μ Mu (m).	ω Omēga (ō).

Greek Fire. An incendiary composition used in early times. The invention of Greek fire is ascribed to Callicinus, in the 7th century, but there seems reason to believe that it came originally from India. The accounts of its effects are so mingled with obvious fable that it is difficult to arrive at any just conclusion as to its power, but the mixture seems to have been highly inflammable, and to have possessed the power of burning under water. The process of making it was kept secret for several centuries, but the knowledge of its composition gradually spread until at the time of the discovery of gunpowder it formed a recognized defensive element in most wars from Western Europe to Asia Minor. See FIRE-SHIPS.

Green. Raw; untutored; ignorant; inexperienced.

GREEN-HAND. Embarked for the first time, and consequently inexperienced.

GREEN-HORN. A lubberly, uninitiated fellow. A novice of marked gullibility.

GREEN-MEN (*Eng.*). The five supernumerary seamen who had not been before in the Arctic Seas, whom vessels in the whale-fishery were obliged to bear, to get the tonnage bounty.

Green, Charles, Commodore U.S.N. Born in Connecticut. Appointed from Connecticut, May 1, 1826; receiving-ship "Independence," Boston, 1826; sloop "Erie," West India Squadron, 1827–28; sloop "Peacock," West Indies, 1829–31.

Promoted to passed midshipman, April 28, 1832; New York Station, 1831–34; frigate "Brandywine," Pacific Squadron, 1834–37.

Commissioned as lieutenant, March 8, 1837; sloop "Levant," West Indies, 1838; receiving-ship at New York, 1839–40; sloop "Falmouth," Home Squadron, 1841–43; steamer "Union," Norfolk, 1847; steamer "Michigan," lakes, 1848–50; steamer "Fulton," 1852; receiving-ship "Ohio," Boston, 1853–55.

Commissioned as commander, September 14, 1855; New York Navy-Yard, 1857–58; light-house inspector, Buffalo, 1858–61.

Commissioned as captain, July 16, 1862; commanding "Jamestown," 1861–62; on blockade off Savannah, Fernandina, Wilmington, N. C.; captured and sent into port or destroyed six prizes; sent the boats and destroyed the bark "Alvarado," under guns of fort at Fernandina; commanding receiving-ship "Ohio," Boston, 1863–65; light-house inspector, ninth district, New Orleans, 1865–67.

Commissioned as commodore, March 12, 1867. Retired November 15, 1862.

Green, Joseph F., Rear-Admiral U.S.N. Born in Maine, November 24, 1811. Appointed midshipman, from same State, November 1, 1827; attached to sloop-of-war "Vandalia," Brazil Squadron, 1830; Naval School, Norfolk, 1833.

Promoted to passed midshipman, June 10, 1833; frigate "Potomac," Mediterranean Squadron, 1835–37.

Commissioned as lieutenant, February 28, 1838; sloop "Erie," West India Squadron, 1840; frigate "Columbus," Brazil Squadron, 1843–45; rendezvous, Boston, 1846; ship-of-the-line "Ohio," Pacific Squadron, during all of the Mexican war. Lieut. Green took part in all of the important actions on the Pacific coast. He remained in the "Ohio" until 1850; navy-yard, Boston, 1851–52; ordnance duty, 1853–54; Naval Academy, 1855–58.

Commissioned as commander, September 14, 1855; waiting orders, 1859–60; ordnance duty, 1861.

Commissioned as captain, July 16, 1862; commanding steam-sloop "Canandaigua," South Atlantic Blockading Squadron, 1862–64; participated in the bombardment of Fort Wagner; ordnance duty, Boston Navy-Yard, 1866–68.

Commissioned as commodore, July 24, 1867; special duty, 1869; commanding Southern Squadron of the Atlantic Fleet, 1870–71.

Commissioned as rear-admiral, July 13, 1870. Retired November 25, 1872.

Green-bone. The trivial name of the viviparous blenny, or guffer, the backbone of which is green when boiled.

Greene, Theodore P., Rear-Admiral U.S.N. Born in Montreal, Canada. Appointed midshipman from Vermont, November 1, 1826; in sloops "Warren," "Ontario," and frigate "Constellation," Mediterranean Squadron, 1827–32.

Promoted to passed midshipman, 1832; sloop "Vincennes," Pacific Squadron, and cruise around the world, 1834–36.

Commissioned as lieutenant, December 20, 1837; razee "Independence," Brazil Squadron, master and lieutenant, 1837–39; receiving-ship at Boston, 1841–42; schooner "Porpoise," 1843; store-ship "Lexington," 1844; frigate "Congress," Pacific Squadron, during Mexican war, 1846–48 (six months in command of land forces at Mazatlan); sloop "Cyane," Home Squadron, 1852–53; navy-yard, Boston, 1854–56.

Commissioned as commander, September 14, 1855; light-house inspector, 1858–60; navy-yard, Mare Island, Cal., 1861–62.

Commissioned as captain, July 16, 1862; commanding "St. Iago de Cuba," and "San Jacinto," 1863–64; while commanding latter vessel, left in command of East Gulf Squadron, on return of Rear-Admiral T. Bailey to United States; commanding "Richmond," West Gulf Squadron, 1865 (protected troops landing for attack upon Mobile); ordnance duty, Portsmouth, N. H., 1866; commanding "Powhatan," Pacific Squadron, 1867.

Commissioned as commodore, July 24, 1867; commanding Pensacola Navy-Yard, 1868–70.

Commissioned as rear-admiral, May 24, 1872. Retired November 1, 1871.

Green-fish. Cod, hake, haddock, herring, etc., unsalted.

Greenland Dove. The puffinet; called *scraber* in the Hebrides.

Greenland Whale. See RIGHT WHALE.

Greenock. A seaport town of Scotland, on the S. side of the Firth of Clyde. Lat. 55° 56′

54″ N.; lon. 4° 45′ 15″ W. Greenock has a flourishing mechanics' institute, numerous banks, custom-house, chamber of commerce, seaman's asylum, yards for building iron ships. It has old and new harbors, constructed at great expense, with extensive docks and quays. Pop. 58,000.

Green Sea. A large body of water shipped on a vessel's deck; it derives its name from the green color of a sheet of water between the eye and the light when its mass is too large to be broken up into spray.

Green-slake. The sea-weed otherwise called *lettuce-laver.*

Green Turtle. See TURTLE.

Greenwich, co. of Kent, England, on the right bank of the Thames, 3¾ miles E.S.E. of London Bridge. Lat. of the observatory, 51° 28′ 38″ N.; lon. 0° 0′ 0″. The educational establishments are numerous. Here are royal schools for the children of officers, seamen, and marines. But the principal object of interest in Greenwich is its magnificent naval hospital for the maintenance of veteran, wounded, or unfortunate seamen. It stands on the bank of the river, is 865 feet in length, and covers, with the schools, civil offices, lawns, and burial-grounds attached, a space of 40 acres. A portion of the building is occupied by the Royal Naval College. Pop. of the town, 40,500.

Greep. An old spelling of *gripe.*

Grego. A coarse Levantine jacket with a hood. A cant term for a heavy overcoat.

Gregory, Francis H., Rear-Admiral U.S.N. Born in Norwalk, Conn., October 9, 1789; died at Brooklyn, N. Y., October 4, 1866. He first entered the merchant service; became a midshipman, January 16, 1809; lieutenant, June 28, 1814; commander, April 28, 1828; captain, January 18, 1838; rear-admiral (retired list), July 16, 1862. His first services were near the Balize, where he captured an English brig having 120 slaves on board, also a schooner fitting for piratical purposes; had a night action with a privateer, which he disabled and drove off the coast, and took a Spanish pirate of 14 guns. While serving on Lake Ontario, under Chauncey, in the war of 1812, he was captured in August, 1814; sent to England, and confined 18 months. He next served 3 years in the Mediterranean, under Commodore Shaw, whose daughter he married. From 1821 to 1823 he commanded the "Grampus," in the West Indies. Near St. Croix he captured the notorious pirate-brig "Panchita," a vessel far superior to his own in weight of metal and number of men. He commanded the frigate "Raritan" in the Mexican war. His last sea service was in command of the African Squadron. During the Rebellion he superintended the construction of ironclads.

Grenade. A shell thrown from the hand (see HAND-GRENADE), or placed in baskets or barrels and fired from mortars of large calibre. *Rampart-grenades* are larger than the hand-grenade, and are intended to be rolled down ramparts, etc.

Grenado. An old word for a live shell.

Grenville, Sir Richard, an English vice-admiral, born about 1540. In 1591 attacked a Spanish fleet of more than 50 vessels with a small squadron of 5 vessels. The battle was one of the most obstinate on record, several of the Spanish vessels being sunk. The English were finally obliged to surrender, Grenville soon after dying of his wounds.

Greve. A low, flat, sandy shore.

Grey-friars (*Eng.*). A name given to the oxen of Tuscany, with which the Mediterranean fleet was supplied.

Grey-head. A fish of the haddock kind.

Greyhound. A hammock with very little bedding.

Grey Town. A seaport town of Nicaragua, on the east coast, at the mouth of the navigable river San Juan. It is the principal seaport of Nicaragua. Lat. 10° 55′ N.; lon. 83° 43′ W. The harbor, once the finest on the coast of Central America, is badly silted up. Pop. 1250.

Griban. A small two-masted vessel of Normandy.

Gridiron. A stage or frame made of heavy beams of wood for receiving a ship, in order that her bottom may be examined when the tide falls.

Gridiron-valve. A slide valve containing several ports or openings, working on a corresponding face, used as an expansion or cut-off valve.

Grier, William, Surgeon-General U.S.N. Born in Ireland. Appointed from Maryland, March 7, 1838; entered the service as assistant surgeon; attached to sloop "Cyane," Mediterranean Squadron, 1838–41; store-ship "Erie," Pacific Squadron, 1842–44; schooner "Shark," Pacific Squadron, 1844–46; hospital, New York, 1848; razee "Independence," Mediterranean Squadron, 1849–52.

Commissioned as surgeon, April 14, 1852; fleet-surgeon, North Pacific Surveying Expedition, 1853–56; Naval Academy, 1859; sloop "Macedonian," 1861; receiving-ship, Baltimore, 1862; Naval Hospital, Memphis, Tenn., 1863–65; special duty, Hartford, Conn., 1867; member Board of Examiners, 1868–69; special duty, Baltimore, 1869–71; member of Examining and Retiring Boards, 1871–72; Naval Hospital, Annapolis, 1872; member of Naval Medical Board, 1872; president of Naval Medical Board, 1872–76; chief of Bureau of Medicine and Surgery (surgeon-general), 1877–78; retired, 1878.

Griffin, or Griff. A name given to Europeans during their first year in the East; it has become a general term for an inexperienced youngster.

Grig. A small eel.

Grilse. Generally considered to be a young salmon after its first sojourn at sea, though by some considered to be a distinct fish.

Grind. A half kink in a rope.

Grip. The handle of a sword or pistol. To grasp with the hand; to hold; to bite; as, the anchor *grips.*

Gripe. A piece bolted to the foreside of the stem to complete it below the cut-water. A vessel gripes when she tends to come up to the wind against the helm when sailing close-hauled. This tendency may be remedied by trimming the vessel by the stern.

Gripes. Broad bands formed by strands woven together and fitted with thimbles and laniards; used for securing boats when hoisted. *Griped-to,* the situation of a boat when secured with gripes.

Grit. Spunk; nerve. Rough, hard particles.

Gritt. A kind of sea-crab.

Groats (*Eng.*). A monthly allowance for each man, formerly assigned to the chaplain for pay.

Grobman. A term for a sea-bream about two-thirds grown.

Grodan. A peculiar boat of the Orcades.

Grog. Diluted spirits formerly issued to the navy. In 1740 Admiral Vernon introduced it into the British navy, and it was said to have been named from his grogram coat. Pindar, however, alludes to the Cyclops diluting their beverage with ten waters. The spirit-ration was abolished in our navy September 1, 1862. See RATION.

GROG-BLOSSOM. A red confluence on the face of an excessive drinker.

GROGGY. Stupefied by drink.

Grog-grog. The soft cry of the solan goose.

Grogram. A coarse stuff of which boat-cloaks, heavy coats, etc., were made. See GROG.

Gromal. An old word for *gromet* (which see).

Gromet. A boy of the crew of the ships formerly furnished by the Cinque Ports. His duty was to keep ship in harbor.

Grommet, or Grummet. A ring formed of a single strand of rope, laid in three times round.

GROMMET-WAD. See WAD.

Groove. The channel between the lands in rifled guns.

Gropers (*Eng.*). Ships stationed in the Channel and North Sea.

Grosetta. A minute coin of Ragusa, somewhat less than a farthing.

Ground. To take the bottom or shore; to be run aground through ignorance, violence, or accident. The surface of the earth. *To strike ground*, to obtain soundings. *To break ground*, to heave the anchor clear of the bottom.

GROUNDAGE. A local duty charged on vessels coming to anchor in a port or standing in a roadstead, as *anchorage.*

GROUND-BAIT, or GROUNDLING. A loach or loche.

GROUND-GUDGEON. A little fish, the *Cobitis barbatula.*

GROUND-SEA. The West Indian name for the swell called *rollers*, or in Jamaica the *north sea.* It occurs in a calm, and with no other indication of a previous gale. The sea rises in huge billows, dashes against the shore with roarings resembling thunder, probably due to the "northers," which rage off the capes of Virginia, round to the Gulf of Mexico, and drive off the sea from America, affecting the Bahama Banks, but not reaching to Jamaica or Cuba. The rollers set in terrifically in the Gulf of California, causing vessels to founder or strike in 7 fathoms, and devastating the coast-line. See ROLLER.

GROUND-STRAKE. A name sometimes used for *garboard strake.*

GROUND-SWELL. A swell which rises along the shore, often in fine weather and when the sea beyond is smooth.

GROUND-TACKLE. A general name for all anchors, and for the ropes, chains, purchases, etc., belonging to the anchors.

GROUND-TIER. The lowest tier of anything.

GROUND-TIMBERS. In making up the frame of a wooden ship, the timbers of the lower course are called *ground-timbers.*

GROUND-WAYS. The large pieces of timber laid across the slip or dock to place the blocks on.

Groundling. A fish that keeps at the bottom of the water; the spined loach (*Lobitis trenia*).

Group. Objects arranged in a cluster, in contradistinction to those arranged in a series.

Grouper. A variety of the snapper much used for food in the West Indies.

Grout-head. A certain kind of fish, the groutnol.

Grow. A word used in connection with the chain to indicate the direction of the anchor; as, the chain *grows* on the starboard bow.

Growl. To grumble; to complain.

Grub. Provisions in general. *Fresh grub*, fresh provisions.

GRUB-TRAP. A vulgarism for the mouth.

Gruff-goods. An Indian return-cargo consisting of raw materials; as, cotton, rice, sugar, pepper, etc.

Grumbler. The gurnard, a fish of the blenny kind, which makes a rumbling noise on reaching the surface of the water.

Grummet. See GROMMET.

Grunter. A name of the Pogonias of Cuvier, a fish also called *banded drum* and *young sheep-skin*, so called from the peculiar grunting sounds made by it.

Grus (*Lat.* "The Crane"). A constellation to the south of Piscis Australis; the only bright star in it bears southwest from Fomalhaut.

Gryphon. An old term word for *typhoon.*

Guano. The excrement of sea-birds, a valuable manure found in thick beds in all tropical climates. The transport of it occupies a number of vessels, called *guaneros.* It is of a dingy yellow color, and offensive ammoniacal effluvium. Capt. Shelvocke mentions it in 1720, having taken a small bark laden with it.

Guara. The singular and ingenious rudder by which the rafts or balsas of Peru are enabled to work to windward. It consists of long boards between the beams, which are raised or sunk according to the required evolution,—a device not unlike sliding-keels or centre-boards.

Guard. The body of marines attached to a vessel or naval station.

Guarda-costas. Spanish vessels of war of various sizes, which cruise against smugglers.

Guard-boat. A boat appointed to row the rounds among the ships of war in a harbor. A picket-boat. Also, a boat employed to enforce the quarantine regulations.

Guard-fish. A corruption of the word *gar-fish.*

Guard-irons. Curved bars of iron placed over the ornaments of a ship, or over life-buoys, to defend them from damage.

Guardo. A receiving-ship; a vessel on which men are kept in readiness for sea-service.

GUARDO-MOVE. A trick upon a landsman.

Guard-pile. A pile of the nature of a fender, in front of a wharf, to protect the structure from violent shocks.

Guards. The widening of the deck of a vessel forward and abaft the paddle-wheels.

Guard-ship. A vessel of war appointed to superintend, for the time being, the marine affairs in a harbor. Each ship in the harbor takes this duty for 24 hours, being relieved at colors in the morning. The vessel on duty hoists the guard-flag at the fore.

Gubber. Black mud. One who gathers drift-wood, etc., along a beach.

Gudgeon. The *Gobio fluviatilis*, a river-fish 6 or 7 inches in length. One of the metal braces bolted upon the stern-post, in the eye of which a pintle works.

Guebres. Fire-worshipers.

Guernsey. See Jersey.

Guess-warp. A hawser carried to a distant object and made fast, in order to warp a vessel towards it. A portion of the hawser is coiled in the boat to insure reaching the destination; it is from the necessity of judging the distance by the eye that we have the term *guess-warp*.

Guest, John, Commodore U.S.N. Born in Missouri. Appointed from Arkansas, December 16, 1837.

Promoted to passed midshipman, June 29, 1843; frigate "Congress," Pacific Squadron, 1845–48; war with Mexico, battle of San Gabriel, Cal., January 8, 1848, battle of Mesa, Cal., January 9, 1848.

Commissioned as lieutenant, December 24, 1850; sloop "Plymouth," and "Susquehanna," in Japan Expedition, at the first landing of Americans in Japan, under Commodore Perry; East India Squadron, 1851–55; boarded with the cutter of the "Plymouth," at Shanghai, 1854, the Chinese man-of-war "Sir H. Compton," and liberated a pilot-boat's crew who were under the protection of the American flag; in April, 1854, was second in command of the "Plymouth," under Capt. John Kelley, in a severe and victorious action with the Chinese, at Shanghai, to prevent aggression on foreign residents; special duty, Washington, 1855–56; steam-frigate "Niagara," laying the first telegraph cable across the Atlantic, 1857–58; rendezvous, Philadelphia, 1859; frigate "Niagara," returning Japanese Embassy to Japan, 1860; commanding steam-frigate "Niagara," West Gulf Blockading Squadron, 1861; in command of the boats of "Niagara," cut out the schooner "Aid," then under the protection of Fort Morgan, Mobile Bay, August, 1861; commanding steamer "Owasco," West Gulf Blockading Squadron, 1862; at Forts Jackson and St. Philip, and capture of New Orleans, 1862; battles on the Mississippi up to and including Vicksburg, 1862.

Commissioned as commander, July 16, 1862; commanded "Owasco" at the capture of forts at Galveston City; commanding ironclad "Sangamon," the first U. S. vessel fitted with a spar-torpedo, the invention of Capt. Guest, South Atlantic Blockading Squadron, 1863; commanded the "Galatea," on convoy duty in West Indies, in 1863–65; commanding steamer "Iosco," North Atlantic Blockading Squadron, 1864–65; present at the two attacks on Fort Fisher.

Commissioned as captain, July 25, 1866.

Commissioned as commodore, December 12, 1872; senior officer of Board of Inspection of Vessels, 1872–76; commandant navy-yard, Portsmouth, N. H., 1877–78. Died January 12, 1879, while in command of Portsmouth Navy-Yard.

Guest-warp Boom. An old term for the swinging-boom.

Guffer. A British sea-fish of the blenny tribe, remarkable as being ovo-viviparous.

Guide-blocks. In the steam-engine, adjustable metallic pieces, with parallel sides, fitted to a cross-head and sliding in guides for keeping the axes of piston-rods coincident with or parallel to that of the cylinder. Sometimes called cross-head gibs. Blocks of wood or metal used to constrain a moving body to a given path.

Guillem. A sea-fowl. (See Lavy.)

Guillemot. A web-footed diving sea-bird allied to the auks.

Guimad. A small fish of the river Dee.

Guinea-boat. A fast-rowing galley, of former times, expressly built for smuggling gold across the Channel, in use at Deal.

Guinea-man. A negro slave-ship.

Guinea-pigs. The younger midshipmen of an Indiaman.

Gulden. A name for a water-fowl.

Gulf. A gulf is a wide opening from the sea, generally larger than a bay. Many gulfs, however, are really bays, and many bays are larger than most gulfs. The number of gulfs is much less than of bays. Keith Johnson enumerates about 170, of which 88 are in Europe, 39 in Asia, 13 in North and 10 in South America, 12 in Oceanica, and 8 in Africa. There are more gulfs, as there are fewer bays, in Corsica and Italy, there being 15 in the former and 13 in the latter country. Norway, Sweden, Denmark, Holland, and Spain have no gulfs, if we except the Bothnia Gulf, washing the shores of Sweden. Prussia has but the Dantzic Gulf, France only the Golfe du Lion, and England the gulf called "The Wash." On the north of Europe there are 6, on the east 9, in the Baltic 4, in the Mediterranean 64, on Black Sea coasts, 4. Fewer arms of the sea penetrate the other great divisions of the earth's surface, especially the *solid* continents of Africa and South America. Under the head of gulfs are included the bodies of water named in Scotland *firths*, and on the coast of Africa and Australia, *bights*.

The great gulfs of the world are 9 in number. Others are not much less in size or importance, but many are small and of comparatively little importance commercially, physically, or historically.

The two great gulfs of Europe are the Bothnia Gulf and the Gulf of Finland, both arms of the greater Baltic Sea. Of these, the more northern is the Gulf of Bothnia, extending from 60° to 66° N. lat., and from 18° to 25° E. lon., being about 400 miles long and 120 average width. Into it empty 18 large rivers, 300 to 400 miles long, and an infinity of smaller streams, coming from the mountains and glaciers of Sweden and Finland, and the outlets of scores of lakes. These render its waters so fresh that it generally freezes over, and a Russian army crossed on the ice in 1809. It contains many groups of islands near both shores, and the mouth of the gulf is partly occupied by the Aland Archipelago, containing several large and many small islands. Many bays open into it, and a number of important cities are situated on or near the coasts, chief of which is Tornea, at the head of the gulf. Its harbors are more commodious than other parts of the Baltic, but it is not so deep, 20 fathoms being the most usual depth.

The Gulf of Finland, also an arm of the Baltic, is included between lat. 59° and 60° 30′ N. and lon. 22° and 30° 30′ E., entirely within the limits of Russia, being 200 miles long and 60 miles average breadth. Its harbors are more numerous than those of Bothnia Gulf, but its navi-

gation is more difficult. Many large rivers empty into it, fed by the waters of large lakes, as Ladoga, Peipus, etc. The Neva is the largest of these rivers. Numerous bays and inlets indent the shores, and multitudes of small islands line them. The city of St. Petersburg is situated near its head, and Revel, Viborg, and other important places are near its coasts. The navigation of the gulf is important and its commerce considerable, although interrupted by the rigors of the climate.

Asia possesses three gulfs of great size,—the Gulf of Siam, the Gulf of Aden, and the Persian Gulf. The Gulf of Siam extends from lat. 7° to 13° N. and lon. 99° to 105° E., containing about 76,000 square miles. It receives the waters of the Menan and a part of those of the Cambodia River. It washes the coasts of Siam and the Malay peninsula. It contains numerous islands, and its fisheries and commerce are important.

The Gulf of Aden is a narrow inlet by which the waters of the Red Sea find their way to the Sea of Arabia. It lies between lon. 44° and 52° E. and lat. 10° and 15° N., and washes the burning shores of Arabia and Abyssinia. A few small rivers empty into it, and half a dozen bays line the coasts. It contains but few islands, is deep, and easily navigated, but is excessively hot. Through it passes the commerce of India, going to the Suez Canal. Aden is the most important city on its shores. Its area is about 110,000 square miles.

The Persian Gulf is a sea or inclosed sheet of water, lying between Arabia and the Persian and Turkish dominions. It also empties its waters into the Arabian Sea by the Straits of
Ormuz, 32 miles wide. It is oval in shape, of
miles long, extending from lon. 47° to lon, for
E., and 160 in breadth, extending from lil the
to lat. 30° N. The climate here is vions are
northwest winds prevail, and violent ns in the
frequent. The most famous empires to the dry-
were situated on its borders, and itery returns.
has always been important, but is r slowly dried,
what difficult from the numerod given a wash
ated in it. The chief cities nthracite, German
near the head, and Bushire, is, when they are
phrates and Tigris pour into en a gentle heat.
of water drained from the hily dried, and some-
Persia, and have greatly c sand is put over the
sions by the alluvial muon plate laid on and
down. The pearl-fishery sk is built up, section
the Arabian coast, belond by iron beams to the
is very important. old is now ready for re-

In Australian waters s fixed in a tripod, called
pentaria is most importble or set-screws under
shores of Australia, exre it properly. The core
17° 30′ S. lat., and fpipe fluted externally and
containing some 75,0 besides having a slight ta-
rivers empty into itwal. This pipe is wrapped
situated near the she and covered with the
have yet been formed put on very damp, and

On the American After this is partially
large gulfs, but threating is applied, and made
and importance. Theindrical by turning on a
between the 46th anst a wooden straight-edge,
and the 57th and 65 and washed as is the rest
washing the shores of the core-stem is fitted
Scotia, New Brunswic having couplings for the
nects with the Atlantig carefully centred it is
Isle to the northward o to the sides of the pit,
the St. Paul's Channel gs to the flask. Grates
Canso to the southward. It contains the large islands of Anticosti, Prince Edward, and the Magdalen Group. Its shores are steep, rocky, and shrouded in dense fogs. Into it empties the great St. Lawrence, the outlet of the northern lakes, bringing per hour more than 1,670,000 cubic feet of water. The fisheries are very important and the commerce considerable.

The great Gulf of Mexico is situated be used
18° and 31° N. lat., and 81° and 98° W which
containing some 800,000 square milace, and
is circular, deep, and has few islan without
navigation is generally easy, except the metal,
coast of the United States, where To prepare
islands, etc., lie in the way. Therd and evenly
winds prevail, and bring with rough boards on
Gulf Stream, that turns to the different kinds of
striking the current of thcted, weighed, and
emerges from the Straits of es and most refrac-
sissippi pours the drainingstop. These prepara-
tinent into the gulf, discance, slight variations
for 200 miles, and other of the resultant metal,
The commerce is impq be perfectly dry. The
during a part of the vent furnaces are connected
tion precarious. servoir, where the different

The Gulf of Calibefore running into the gun-
washing the shor furnaces are all ready the
lat. 23° and 32° and so controlled that the iron
and containinged at the same time, or as near
A few large. The length of time to melt or
among thiron "down" may vary several hours,
the depends mainly on the size of the charge
tid the state of the atmosphere. When the
charge is nearly melted it is stirred with wooden or iron poles to bring unmelted lumps up to the flame. When the iron is well down, a little is ladled out and run into a green-sand mold, cooled and broken, and from it the state of the charge is at once ascertained by the experienced eye of the founder. If not sufficiently decarbonized, the fusion is kept up with a continuance of the stirring, for on its proper decarbonization depend in a great measure the density and tensile strength. When all the furnaces are ready they are tapped at the same time, and the metal runs from them into the reservoir or "mixing basin," after which it goes into the runners of the mold and enters into it by the side gates,—generally one in each section from each runner, and with an upward direction. As the metal rises in the mold it is stirred and prevented from depositing dirt and scoria about the core and in the trunnions. When the mold is filled the tap-holes of the furnaces are plugged, but from time to time, for an hour or more, metal is poured in from a ladle to the riser to feed shrinkage. As soon as the furnaces are tapped the water is turned on from the hydrant, and entering the core-barrel through a metallic pipe reaching nearly to the bottom, finds its way up along the interior and out by the escape-pipe. Half an hour after casting, the change in temperature of the water having been brought to about 25° F., the flow remains constant from that time. The fires in the pit are lighted by dropping melted iron on them towards the end of the casting. When the change in temperature of the water has become constant, say in about fifteen hours, the core is withdrawn, the rope wrapping taking fire as it comes to the air. After the core is withdrawn, the water is conducted to the cavity left by it, and, welling

minute pores, within which the spores are to be found, growing in fours on the summits of slender stalks (*basidia*), easily visible under a magnifying power of about 200 diameters. The mycelium may, however, be detected with the naked eye as white threads lying between the bundles of woody fibre and parallel with them. Under the microscope, the mycelium is seen to consist of very minute branching filaments, matted or felted together.

Since the dry-rot fungus flourishes only under the conditions of moisture, darkness, and confined air, its growth may probably be prevented on shipboard by such a system of construction as shall afford free ventilation of the bilges, frame-spaces (by boring through filling-chocks and by openings on the spar-deck), spaces beneath store-room floors, and recesses behind bulkheads; by forced ventilation, as now practiced in the U. S. S. "Richmond"; and by keeping the holds and lower decks dry. Extensive experiments are now (1880) being prosecuted by the Navy Department with a view to the preservation of ship-timber from decay, by impregnation under pressure with carbolic acid ("Burnettizing"), and with barium sulphate (the "Thilmany process"), from which good results are hoped for.

Besides the pecuniary loss resulting from the ravages of dry-rot, it appears to afford a peculiarly favorable nidus for the development of the yellow fever poison, and the preservation of its vitality against the unfavorable influence of cold weather. See Yellow Fever.

Other fungi, such as a cobweb-like growth on the under side of wet planks (*Helminthosporium*), molds, and patches of surface discoloration, are common on shipboard, but do not appreciably influence the decay of wood.—*J. H. Kidder, Surgeon U.S.N.*

Dub. A term for a pool of deep smooth water in a rapid river.

Dubb. To cut off and smooth with an adze the superfluous wood. *To dubb a vessel bright*, is to remove the outer surface of the plank completely with an adze. Spotting with the adze to examine planks is also dubbing.

Dubbah, or **Dubber.** A coarse leathern vessel for holding liquids in India.

Dubhe. A standard nautical star in the Great Bear, *α Ursæ Majoris.*

Dublin. The capital city of Ireland, on the Liffey, close to its entrance into Dublin Bay, Irish Sea, 66 miles W. of Holyhead, and 135 miles W. of Liverpool. Lat. 53° 23′ 2″ N.; lon. 6° 20′ 5″ W. The harbor has been latterly much improved, and near the mouth of the Liffey are the Grand Canal and the custom-house docks, the latter occupying 8 acres; depth at low water 12 feet, at high tides 24 feet. The bay is noble and picturesque, and esteemed one of the finest in the United Kingdom; it is about 7 miles in breadth at its entrance, between Howth Head, on the north, and Kingston, on the south. Pop. 246,300.

Ducat. A well-known coin in most parts of Europe. See Money.

Ducatoon. A coin of the Dutch Oriental Isles, value about $1.70. Also, a silver coin of Venice, value about $1.10.

Duck. To dive, or immerse another under water. The finest canvas for small sails is sometimes called *duck;* but it is really a lighter cloth than canvas, and is much used by seamen and soldiers in hot climates for frocks and trousers.

Ducking. A penalty which veteran sailors inflict on those who, for the first time, pass the tropics, the equator, or formerly even the Strait of Gibraltar, and usually performed in a tub or half-butt, with the assistance of a few buckets of water; the usual fine, however, generally prevents the penalty being inflicted.

Ducking at the Yard-arm. A marine punishment formerly inflicted by the French for grave offenses; the criminal was placed astride a short thick batten, fastened to the end of a rope which passed through a block at the yard-arm. Thus fixed he was hoisted suddenly up to the yard, and the rope being then let go he was plunged into the sea. This operation was repeated several times, conformable to the sentence; a gun advertised the other ships of the fleet that their crews might become spectators. If the offense was very great he was drawn underneath the keel of the ship, which was called keel-hauling. See Keel-hauling.

Ducks. The general name for a sailor's dress in warm climates.

Duck Up. To raise the clew of the mainsail or foresail when it interferes with the steering by shutting out the landmarks.

Dudgeon Wrath. An old word for the box-handle of a dirk.

Duds. A cant term for clothes or personal property. The term is old, but still in common use, though usually applied to clothing of an inferior quality.

Duel. In former days duels were of frequent occurrence in the navy, but latterly they are almost unknown. It is forbidden by the regulations to send or accept a challenge to fight a duel or act as second in a duel, and courts-martial are empowered to inflict any punishment for this offense, except death, flogging, or imprisonment at hard labor.

Duff. A sort of pudding. The posterior.

Duffer. A low peddler. A woman who assists smugglers. A stupid or cowardly fellow.

Dugong. An herbivorous mammal of the East Indian seas, intermediate between the *Cetacea* and the *Pachydermata*, having an elongated body, with flippers near the head, and terminated by a crescent-shaped tail.

Dug-out. A canoe hewn from one tree.

Duguay-Trouin, René, one of the most illustrious of French sailors, was born at Saint Malo, 10th of June, 1673, and died at Paris, 27th of September, 1736.

He came from a family of sailors, but was himself destined from childhood to be an ecclesiastic, going early to the College of Rennes, where he donned the soutane, and received the tonsure, with a view to succeeding to a rich benefice which friends of his family had in their gift.

His father died when he was only fifteen, and he was then sent to Caen to study philosophy. Here his sanguine temperament and love of pleasure caused him to break bounds, and he neglected his studies for the dissipations of a large city. His escapades at last became quite notorious, and he was forced by his family to return to Saint Malo, whence he was soon sent to sea in the *corsaire* "La Trinité," in which his

family had a large interest. This was in 1689. He remained in this vessel for two years, undergoing considerable hardship, but always distinguished for his conduct in numerous engagements with English and Dutch vessels.

After this apprenticeship, he went to sea in another vessel, of 18 guns, when he showed so much courage and conduct that he was given a command, being then only 18 years of age. After this he continually distinguished himself by attacks upon the English shipping, both in privateers and in vessels of the state. In 1694, while in command of the "Diligente," a 40-gun frigate, he was surrounded by an English squadron of six men-of-war, under Admiral Sir David Mitchell. After fighting for twelve hours, his crew were nearly all killed or wounded, he himself was wounded, and his ship on the point of sinking, so he was obliged to surrender. He was imprisoned at Plymouth, where he managed to make a friend of a pretty bumboat woman, and with her assistance escaped in a small boat, with his lieutenant, his surgeon, the boatswain, and a servant. After forty-eight hours of very rough weather they managed to reach the coast of Brittany.

He was soon at sea again, in a ship of 48 guns, in which he took two English men-of-war of superior force, one of which he brought in. For this action he received a sword of honor, and was invited to join the fleet of the Marquis de Nesmond, where he had his usual success in making prizes.

After this cruise he went to Paris, to be presented to Louis Quatorze, and received many honors while there. He did not remain long, however, returning to his sea-life, and had command of several small squadrons, which he handled with his accustomed ability, having been made *capitaine de frégate* of the royal marine.

After the peace of Ryswick he passed four years of enforced idleness; but upon the breaking out of the war of the Spanish succession, he was again promptly at sea, serving against the Hollanders and the English, in which he passed through many battles and many perils. In 1705, when thirty-two years of age, he was made *capitaine de vaisseau*, and very shortly after, in consequence of continued successes against the Portuguese, English, and others, he, with his elder brother (two younger ones had been killed while serving under him), received letters of nobility.

In 1711 he sailed, in command of a fleet of 7 line-of-battle ships, 8 frigates, and 2 bomb-vessels, with nearly 6000 men, for Rio de Janeiro. He entered the bay under the fire of the Portuguese batteries, and the next day disembarked his force. After some slight resistance the city was abandoned by its inhabitants. Duguay-Trouin then threatened to utterly destroy the place unless a handsome ransom was paid. This was done, and he then set out on his return to Brest, but lost two of his largest vessels on the voyage,—sunk in a hurricane. For this action he received a pension of 2000 crowns and the title of commandant of the marine of Saint Malo; and in 1715, at Versailles, he received the commission of admiral of the fleet.

Louis XIV. died soon after this, and Duguay-Trouin remained at Saint Malo in retirement until 1723, when, under the regency, he was made a councillor for India. In 1728 he was made commander of the order of St. Louis and lieutenant-general. The next year he was made commandant of marine of Brest and of the coasts of Brittany. In 1731 he commanded a fleet fitted out to punish the Barbary corsairs, but the appearance of the force so imposed upon the Moors that they gave every satisfaction without any fighting. Although he continued in service, this was his last active employment. His labors and exposure had undermined a naturally vigorous constitution, and he died in Paris at 63 years of age.

Duguay-Trouin was so disinterested and generous that, in spite of his many captures, he died comparatively poor. His officers and sailors fairly worshiped him, not only on account of his intrepidity, but because of his liberality in regard to prize-money. A statue of him is erected in the "Place Duguay-Trouin," at Saint Malo.

A portrait of this intrepid sailor is in the city hall, and in the museum at Versailles is a statue of him in black marble. The portrait represents him in a rich military costume, decorated with the order of the Holy Ghost. On his bandolier are the arms granted him by Louis XIV.,—two fleur-de-lis and an anchor. He holds a pistol in his right hand, while the left grasps the hilt of his sword. His hat is ornamented with plumes, which, in our day, is not considered naval. There is also a statue of Duguay-Trouin in the Bourse, at Nantes, and there are two other well-known oil-paintings of him. He is represented with a youthful and animated countenance, wears a huge wig, and a coat above his cuirass.

His arms appear upon the picture (given by Louis XIV.),—the fleur-de-lis and anchor,—and the legend, "Didit hæc insignia virtus."—*E. Shippen.*

Duke of York (*Eng.*). A nickname for a peculiar storm-trysail used in the northern seas.

Dulce, Dulse, Delse. One of the edible fuci, *Iridea dulce.* It is plentiful on the rocky coasts of Ireland and western England. It probably derived its name from being sweet and pleasant, not requiring cooking.

Duledge Plate. An old name for the tire or iron plate on the circumference of the wheel of a field-piece. Duledge was also used for dowel, the wooden pin connecting the felloes.

Dull'd. Fallen or moderated; said of the wind.

Duluth. A city and port of entry of Minnesota, the capital of St. Louis Co., is finely situated at the W. end of Lake Superior, and is the eastern terminus of the Northern Pacific Railroad. Lat. 46° 48′ N.; lon. 92° 6′ W. Duluth has a very advantageous position for a commercial city, being at the head of navigation on the great lakes. Pop. 3300.

Dumb-chalder. A metal cleat bolted to the back of the stern-post for one of the pintles to rest upon, to lessen both strain and friction.

Dumb-craft. Lighters, lumps, or punts, not having sails. A name for the screws used for lifting a ship on the slip.

Dumb-pintle. A peculiar rudder-strap.

Dumb-scraping. Scraping wet decks with blunt scrapers.

Dumb-sheave. An aperture without a sheave, through which is rove a rope.

Dumfounder. To confuse or perplex.

up, emerges through a hole in the riser formed by casting in a wrought-iron pipe near the top. Half an hour after removing the core the change in temperature of the entering and escaping water should be brought to about 100° F., when the flow should be kept constant. It is generally several days before the fires in the pit are allowed to die out, and when the gun becomes sufficiently cool the flask is removed all but the breech-section, the gun hoisted out of the pit, the sand and dirt scraped and cut away, and it is ready to go into the finishing-shop.—*H. W. Lyon, Lieutenant U.S.N.*

Guns, Inspection and Proof of. All cannon for the navy, manufactured wholly or partly at private establishments, are fabricated in strict accordance with the terms of the contract made with the Bureau of Ordnance, and subject to the inspection of an officer detailed to supervise the operations. During fabrication or alteration, the metal of guns is closely examined and tested when necessary, and the pieces themselves are examined and measured inside and out in the various stages of manufacture; as the detection of defects and errors that pass the limits of toleration may save useless subsequent labor. Internal defects of metal will often be betrayed by a close examination of the core pieces and interior of bore. As rust tends to conceal defects, examination of the guns takes place before exposure to the weather; and previously to the final examination and proof of guns they are not to be covered with paint, lacquer, oil, or any material which may hide defects of metal. As the water proof, which is of great importance in detecting defects of metal not otherwise developed, necessarily succeeds immediately the powder proof, and can be effectively applied only in fine weather and when the temperature is above the freezing-point, final inspections are made at such times only. If it is ascertained that any attempt has been made to conceal defects, the gun or guns so treated are rejected without further examination.

Instruments. 1. A mirror, for reflecting the sun's rays into the bores. Two will be required if the sun be in the rear of the inspector.

2. A lamp attached to a staff, for examining the bores when the sun is obscured or the guns are under cover.

3. A standard cylinder-gauge.

4. A measuring staff of steel or iron.

5. A chamber-gauge, for verifying the shape and size of conical chambers.

6. A star-gauge, for measuring the diameter of the bore and the chamber.

7. An instrument for verifying the interior position of the vent.

8. Profile-boards for distances in front and rear of the base-line.

9. A trunnion-square of steel or iron, for ascertaining the position of the trunnions with reference to the axis of the bore.

10. A trunnion-gauge, an iron ring of the proper diameter of the trunnions.

11. A trunnion-rule, for measuring the distance of the trunnions from the base-line.

12. A beam-caliper.

13. A cylindrical block, for verifying the size of the breeching-hole.

14. A vent-guide.

15. Vent-gauges of untempered steel wire, with shoulders to prevent them from slipping into the vent.

16. A vent-searcher, a steel wire of the length of the vent, bent to a right angle at the lower end and pointed.

17. A semicircular protractor, of metal, for measuring the inclination of vents or for ascertaining their deviation from the guide.

18. A set of templates, for verifying the shape of lock-lugs, the angle of the rear sight-mass, the curve between the base-line and the front of rear sight-mass, that at the end of the cascabel, the bevel of the breeching-hole, the opening of the cascabel, and the shape of the muzzle-swell.

19. A standard foot-rule, for verifying measures.

20. A foot-rule of steel, for measuring the masses, the length of the trunnions, and for other purposes.

21. A set of ring-gauges, large, medium, and small, for inspecting the projectiles used in proof.

22. A small beam-caliper, with outside edges, for examining the adjusting rings and the ring-gauges.

23. A platform-balance, for weighing the projectiles used in proof and for bringing the shells up to the standard weight.

24. A set of implements for loading and cleaning.

25. A searcher with six or more points, to detect injuries in the bore.

26. A machine for taking impressions of the vent.

27. Hydraulic pump and apparatus for the water proof.

28. Dies for marking.

29. Instruments for determining the velocity of projectiles.

30. A set of internal pressure-gauges.

Powder proof. Powder for the proof of guns must show the highest initial velocity usually exhibited by service powder used in guns of the same calibre and class as those under proof. It must, when possible, be of the same kind, but in any event must assimilate most closely to the service charge in its rate of burning and in the character of the pressures developed. It must be carefully weighed (never measured) and be filled in service cylinders and well settled. The "density of loading" must be the same as for service.

The projectiles must be of full weight and not below the mean gauge; the shells must be filled with a mixture of sand and ashes or sawdust to bring them up to the proper weight of the filled shell. Sabots are used for spherical shell and a grommet-wad over the shot; no wad of any kind is placed over a rifle projectile.

The spiral or other standard gauge for determining the pressure in the bore must be used, and the results recorded carefully after each round.

Gutta-percha or wax impressions of the bore of rifle guns should be taken before and after proof, and the bore should be carefully star-gauged. These impressions and star-gauging must be compared to discover whether any defects have been developed during the powder proof.

Water proof. The pressure to be applied in the water proof is two atmospheres, or 30 pounds to the square inch. The penetration of water

in this proof through the metal of the piece in any place will cause the rejection of the gun; and if, on examination after the water proof, there shall be any defects indicated by weeping or dampness in the bore, the gun will be rejected. The water proof is alone to be depended on to detect minute clusters of cavities in the bore, which for this purpose should be perfectly dry and examined by sunlight. All inspections, consequently, should take place in fair weather and when the temperature is above the freezing-point.

Extreme proof. After undergoing the ordinary proof established for its calibre and class, the gun selected for extreme proof is subjected to at least 1000 rounds with service-charges.

GUNS, MARKING OF. Guns for the naval service, received by authority of the Bureau of Ordnance, are marked in the following manner, viz.:

On the cylinder, in the line of sight near the sight-mass, all accepted guns have stamped an anchor two inches long.

On the base-ring, or line, the initials of the foundry, the register number, and the weight of gun in pounds.

On the right trunnion, the calibre and year of fabrication.

On the left trunnion, the letter P and the initials of the inspecting officer; all the above in one-inch letters.

On the upper jaw of the cascabel, the preponderance in pounds is stamped lightly with half-inch figures.

On the end of the upper jaw, the cascabel block and head of the pin, the foundry number in quarter-inch figures.

The foundry number is also marked on the right rim-base.

Guns rejected for imperfections of any kind will have the letter C stamped on the anchor, so as to partially obliterate it.

The founders are to be dissuaded from selling such guns to other parties, and required to break them up.

Guns rejected for such defects as render them dangerous to those who fire them should be irreparably mutilated, with the consent of the founder.

GUNS, ENDURANCE OF. The endurance of a cast-iron smooth-bore gun with service-charges may be surely predicted by observation of the progressive wear of the interior orifice of the vent. There are certain general forms in which this enlargement takes place. They may be classed as triangular, lozenge, quadrilateral star, circular, and elliptic.

With the ordinary central vent, when subjected to a rapid continuous fire, the enlargement usually takes the form of an isosceles triangle, the apex of one of the angles towards the muzzle and the other two perpendicular to it. With the lateral vent of the Dahlgren system it usually takes the lozenge form, the cracks extending from the opposite angles lengthwise of the bore.

With those rifled cannon in which the vent is bouched, the cracks appear round the bouching; and although the bouching preserves the vent, yet the formation of fissures around the enlarged orifice, when once commenced, causes a greater tendency to rupture. With the vent not bouched, the wear in cast-iron rifled cannon is about double that of the smooth-bore. So long as the wear of the vent is regular and without cracks, a mere enlargement is not indicative of danger; but when it reaches a diameter of four-tenths of an inch, the vent should be closed and a new one opened.

A gun of large calibre should not in service be expected to endure more than 400 or 500 rounds before it will be necessary to open the new vent; which, however, will be of no advantage unless the old one be closed at its interior orifice, on which the gases would otherwise continue to act as a wedge. The first distinct appearance of the cracks, as shown by the button, is the proper limit.

GUNBOAT. A light-draft vessel carrying one or more guns.

GUN-CARRIAGE. A carriage to facilitate the transportation and manipulation of howitzers or great guns. It must have the strength necessary to resist the shock of discharge, stability to retain its upright position when subjected to violent recoil or to the motion of the ship at sea, facility of working, simplicity, and durability. In the navy all gun-carriages except the boat-carriages are built of iron.

GUN-COTTON. See EXPLOSIVES.

GUN-DECK. See DECK.

GUN-FIRE. The firing of the morning or evening gun; familiarly termed "the admiral falling down the hatchway."

GUN-GEAR. Everything pertaining to the management of the guns.

GUN-HARPOON. See HARPOON.

GUN-LOD. A vessel filled with explosives.

GUN-METAL. A bronze consisting of 90 parts of pure copper and 10 parts of tin, allowing a variation of one part of tin, more or less. When the mixture is well made the metal is homogeneous; the fracture is of a uniform yellow color, with an even grain. Its specific gravity is about 8.75, being greater than the mean of the specific gravities of copper and tin. It should be rejected for the manufacture of guns if it contains an appreciable amount of sulphur, .001 of arsenic and antimony, .003 of lead, iron, or zinc, or in all more than .005 of foreign substances.

GUNNADE. A short 32-pounder introduced in 1814.

GUNNEL. See GUNWALE.

GUNNERY. A branch of the military art which has for its object the management of guns and mortars, and of charging and pointing them so as to hit a proposed mark at any distance within the range of the projectile. To accomplish this purpose it is necessary to know the nature of the path which a projectile describes in the air with a given initial velocity, the quantity of gunpowder necessary to produce that velocity, and the elevation that must be given to the gun in order to counteract the effect of gravity and the resistance of the air on the projectile in its flight. Various other considerations require also to be attended to; as the proportion between the length of the gun and the diameter of its bore, the system of rifling, the proper windage, or excess of the diameter of the bore above that of the projectile, the shape of the chamber, the strain upon the metal, and the size or weight of projectile proper to produce a certain effect, as to batter down a wall or to penetrate a ship's side. In a more comprehen-

sive sense, gunnery includes the whole science of artillery and ordnance.

GUNNERY-LIEUTENANT (*Eng.*). One who, having obtained a warrant from a gunnery-ship, is eligible to large ships to assist specially in supervising the gunnery duties; he draws increased pay.

GUNNERY-SHIP. One devoted specially to the training of officers and men in everything pertaining to ordnance.

GUN PENDULUM. A device employed to determine the initial velocity of projectiles by means of the recoil of the gun. The principle is that the explosive force of the powder communicates equal quantities of motion to the gun and to the projectile in opposite directions; consequently, by suspending the gun, loaded with additional weights, in the manner of a pendulum the extent of its arc of vibration will give the means of estimating the quantity of motion impressed on it, whence the initial velocity of the projectile can be computed. See BALLISTIC PENDULUM, ELECTRO-BALLISTICS.

GUN-ROOM (*Eng.*). A compartment at the after part of the lower gun-deck of a large vessel, partly occupied by the junior officers; but in a small vessel it is below the gun-deck and used as a mess-room by the lieutenants.

GUN-ROOM PORTS (*Eng.*). Stern-ports cut through the gun-room in a frigate.

GUN-SHOT. The distance a gun will throw a projectile. See RANGE.

GUN-SLINGS. See SLINGS.

GUN-STONE. An old term for a cannon-ball, from the circumstance that stone was the first material used for cannon-balls.

GUN-TACKLE PURCHASE. A purchase rove through two single blocks. See TACKLES.

GUNWALE (corruption of *gun-wall*). In small craft, the fore-and-aft plank which covers the heads of the timbers.

Gunnel. A spotted ribbon-bodied fish found on rocky bottoms.

Gunner. From the period when ordnance was introduced on board British vessels of war this officer appears to have formed a distinctive class in the royal navy. The complement of the "Henri, Grace de Dieu," consisted of 349 soldiers, 301 marines, and 50 gunners; these gunners correspond to what are now called seaman-gunners. Gunners are warrant-officers, and, under the ordnance-officer, have special charge of the battery, small-arms, magazines, and ordnance stores. For necessary qualifications for appointment, see EXAMINATIONS.

GUNNER, QUARTER. A petty officer attached to each gun-division to take care of the guns and gun-gear, and at quarters, to supply the guns' crews with belts, primer-boxes, etc., and to be ready, during action, to furnish any reserved or spare article that may be required, such as breechings, ladles, worms, etc.

GUNNER'S DAUGHTER. The name of the gun to which the men were *married* or lashed to be punished.

GUNNER'S GANG. The men under the direct superintendence of the gunner, including chief gunner's mate, gunner's mates, quarter-gunners, armorer, armorer's mate, etc.

GUNNER'S MATE. One of the assistants of the gunner, selected by the commanding officer for his experience and reliability. The gunner's mates are stationed in the magazines when at quarters, and in the event of the absence of the gunner, the chief gunner's mate assumes his duties.

GUNNER'S PIECE. The fragment of a burst gun which flies upward.

GUNNER'S QUADRANT. A graduated quarter of a circle of sheet-brass of 6 inches radius, attached to a brass rule 22 inches long. It has an arm carrying a spirit-level at its middle and a vernier at its movable end. To get a required elevation, the vernier is fixed at the indicated degree, the brass rule is then inserted in the bore parallel to the axis of the piece; the gun is then elevated or depressed until the level is horizontal. There is also a graduated quadrant of wood, of 6 inches radius, attached to a rule 23.5 inches long. It has a plumb-line and bob, which are carried, when not in use, in a hole in the end of the rule, covered by a brass plate.

GUNNER'S TAILOR (*Eng.*). An old rating for the man who made the cartridge-bags.

Gunner-flook. A name for the turbot, *Pleuronectus maximus.*

Gunny. Coarse canvas made of fibrous material, as jute.

GUNNY-BAG. A sack made of gunny.

Gunpowder. Gunpowder is made of saltpetre, charcoal, and sulphur, in proportions now generally adopted of 75 parts saltpetre, 15 charcoal, 10 sulphur. The objects to be obtained are:

1. Maximum force.
2. Minimum of initial pressure in bore of gun.
3. Uniformity of action.
4. Freedom from fouling.
5. Durability.

Saltpetre, a compound of 54 parts nitric acid and 46 parts of potash, contains in one volume as much oxygen as is contained in 3000 volumes of atmospheric air. This oxygen when heated to a certain degree combines instantly with the carbon to form carbonic acid and carbonic oxide, and which with free nitrogen form the chief gaseous products of combustion. The potassium is found combined in the solid residue.

Charcoal. Willow and alder are chiefly used. The smaller branches, ½ inch to 1 inch in diameter, are cut in spring when the sap is running, and the bark peeled off. It is generally left to season for a year.

Sulphur. The oxidation of sulphur by saltpetre produces a higher temperature than is obtained with charcoal, and this accelerates combustion.

The ingredients should be thoroughly pulverized before being combined.

The saltpetre being thoroughly dried, is ground in a buhr-stone mill. The charcoal and sulphur, in proper proportions, are placed in iron cylinders or barrels, about 3 feet in diameter and 4 feet long, which have iron bolts placed in them about 1 inch in diameter. The barrels being revolved at about 15 revolutions a minute, are run about 24 hours. The bolts in the drums completely pulverize the ingredients.

The saltpetre, sulphur, and charcoal being pulverized, have now to be incorporated into one mass. There are several modes of doing this,—stamper-mills, wheel-mills, barrel-mills, and a new method of recent invention by Gen. P. A. Oliver, roller-mills.

Barrel-mills consist of a number of barrels about the size of a whisky-barrel, geared to revolve at about 15 revolutions per minute. They each contain about one-half bushel of common marbles; the ingredients sufficient for 8 or 10 kegs of powder are then placed in each, and the barrels are run for about 10 hours. After a steady run they should be stopped and opened and allowed to cool, and then started up again. The marbles in the drums pulverize the ingredients thoroughly.

The powder-meal may now be placed in bins and slightly dampened before going to the press. If desired to still further incorporate it, it is taken to the wheel-mill. A wheel-mill consists of two heavy broad wheels about 2 feet in diameter and 5 or 6 feet high, resting on a bed-plate; they are revolved by a vertical shaft passing through the centre of the bed-plate, to which the axle revolving the wheels is attached. Two plows or knives, one near the vertical shaft and another near the rim, throw the composition under the runners as it works outwards. The charge is spread upon the bed evenly, and a small amount of water sprinkled upon it. Water is added from time to time in sufficient quantity to reduce the effect of explosion, and to incorporate more thoroughly. The wheels are revolved at 8 or 10 revolutions a minute, and from 4 to 8 hours, according to the powder to be made. After the powder has become incorporated, it is taken to the hydraulic press to be pressed into cakes. The mass is placed upon the press in layers, plates of copper or gutta-percha intervening. Eight or twelve hundred pounds are pressed at a time. A pressure of 6000 to 10,000 pounds to the square inch is exerted. When sufficiently pressed, the press-cake, looking like slate $\frac{3}{4}$ to $1\frac{1}{2}$ inches thick, is taken to the coining- or graining-mill. This mill serves to break up the powder into grains. It consists of a series of adjustable rolls, the top one, of gun-metal, being a toothed roll, to break up the cake; under this is another set of rolls geared two to one, which crush the sizes which are too large, and another set under these still further reduce the remaining grains. Sieves shake the dust out of the powder, and other screens of wire-cloth, of different-sized mesh, retain the sizes desired and reject those that are too large, which are carried back to the hopper of the mill by an elevator to be ground over again. The size and shape of the grain form an important factor in our service. Large grains of spherical shape are made to reduce the pressure on the gun, as large grains of that shape burn slower, but it is always at the expense of the powder. It is not the fault of the powder that the gun bursts: it is the fault of the gun. By firing the charge, next the ball, and using three sections of powder, slow, quicker, and very quick, a better result will doubtless be obtained than has hitherto been reached, and more justice done to the powder. After being broken up into grains, the powder is dried at a temperature of about 130° F. Some use boxes or pans, in which the powder is placed in the drying-rooms heated by a furnace. A new patented method, termed hot-air glaze, in which the powder is placed in revolving drums and hot air blown through them, is used by some manufacturers.

The powder is next finished by being placed in the glazing-drums. These consist of large barrels about 3 by 6 feet. In these the powder is placed. The drums are then revolved at about 15 revolutions a minute. The grains of powder are tumbled about in them and rubbed against each other. In the process the powder gets warm and sweats a little, which facilitates the rounding off of the sharp corners. The powder is usually revolved in these drums from 12 to 24 hours, according to the glaze required. When high bright polish is needed, a small quantity of graphite is added. The glazing takes off the rough and sharp edges of the grain, and the powder occupies less bulk in consequence, packs closer, and makes less dust.

In the Oliver process, the ingredients being thoroughly mixed and dampened, are placed in small boxes holding 25 pounds at a time. A box at a time is then placed in the hopper of the incorporating-mill. These consist of 5 pairs of adjustable rolls, with a top pair of rolls regulating the feed. The ingredients passing between these rolls in a very thin stream are intimately ground by each set of rolls successively, the rolls being geared two to one, and pass in a thin train by a rubber apron out-doors, and are dumped into another box holding 25 pounds. When full, this box is carried to the hopper of the press. By this method there are never over 50 pounds damp powder in the incorporating-mill, and outside. This quantity can be reduced to 5 or 10 pounds if desired. The object is to have so little powder in any one place as to do away with any serious damage in case of fire. The ingredients being incorporated, are next taken to the press- and graining-room, both being combined in one. The box of powder is dumped into the hopper of the press, and is immediately pressed into sheets of the desired thickness between 2 large rolls running at equal speed. A belt running under the rolls carries the pressed powder forward under the grainer. This machine consists of knives set in a frame, which is arranged to move up and down by means of an eccentric, cutting the powder as it passes under them. The grained powder next falls upon a shaker, arranged with different-sized screens. The dust is immediately shaken out, and an elevator carries it back into the hopper of the press to be pressed over again. The grains which are too large are brought back by an elevator, and are reduced to the desired size by a pair of rolls of zinc running two to one, placed at the end of the shaker; a second shaker outside the building shakes the balance of the dust out, reassorts the sizes, and dumps the grains into a box holding 150 pounds. This box is at once taken on a car to the dry-house. The dry-house contains the dryer, the joint invention of Patrick Clarch, of Rahway, N. J., and Gen. Oliver. It consists of a box 60 feet long by 14 wide, air-tight at all points except the top. It is furnished with a number of wooden rollers on the top, which revolve in suitable bearings; at each end is a large pulley or roller 3 feet in diameter and 12 feet long. A woolen cloth is placed around these rollers, forming an endless belt, over the whole top of the dryer. The powder is placed on top of the woolen cloth, and the large pulleys revolving, move the cloth forward very slowly. The damp powder goes on at one end, and the dry is dumped off at the other; as it falls it goes over screens, which take out the dust and dump it into boxes. An adjoining building contains

an engine, steam coil, and powerful blower,—pipes lead from coil into box of dryer. The air is blown through the coil, thence into box of dryer, and is forced through the cloth upon which the powder rests, and it is thus dried in a couple of hours.

Gunten. A boat of burden in the Moluccas.

Gunter's Chain. The chain ordinarily used in surveying.

Gunter's Line. A logarithmic line on Gunter's scale, used for performing, mechanically, the operations of multiplication and division.

Gunter's Scale. A wooden rule, on one side of which are marked scales of equal parts, of chords, tangents, sines, etc., and having on the other logarithms of these various parts, by means of which many problems in navigation and surveying may be solved mechanically.

Gurge. A gulf or whirlpool.

Gurnard. A fish of the genus *Trigla*, so called from its peculiar grunt when removed from the water; its head being all skin and bone gave rise to the saying that the flesh on a gurnard's head is rank poison. One or two species are known by the local name of *piper*.

Gurnet. See GARNET.

Gussock. A term for a strong and sudden gust of wind.

Gust, or **Gush.** A sudden blast of wind; a squall.

Gut. A somewhat coarse term for the main part of a strait or channel, as the Gut of Gibraltar, Gut of Canso.

Gutter-ledge. A cross-bar laid along the middle of a large hatchway in some vessels, to support the covers and enable them the better to sustain any heavy body.

Guy. A rope used to support a spar in a lateral direction; as, the jib-guys. A rope used to steady a body when hoisted or lowered.

GUY, BELLY-. A rope supporting the middle part of derrick or sheer-leg.

GUYS, JIB AND FLYING JIB. These go over the ends of their respective booms, leading thence to the ends of the whiskers, and set up at the bows.

GUYS, LOWER-BOOM. Ropes used for rigging in and out, and for steadying the lower-boom when rigged out. The standing part of the forward guy is secured at the end of the whisker, and leads thence through a block on the boom, thence through a block at the bowsprit-cap, thence to the forecastle The standing part of the after guy is hooked to a bolt in the ship's side near the gangway, leading thence to a block on the boom and back through a sheave in the ship's side. The lower-boom guys are sometimes fitted single, hooking to eye-bolts on the boom.

GUYS, SPANKER-BOOM. Fitted in one with the sheets. See SHEET.

Gwiniad. A fish (the *Coregonus fera*, or fresh-water herring) found in North Wales, and allied to the lake white-fish.

Gybe. Another form for *jibe* (which see).

Gymnotus Electricus. An eel from the Surinam River, several feet in length, which inflicts electrical shocks.

Gyn. A three-legged machine fitted with a windlass, heaving in the fall from a purchase-block at the summit, used on shore for mounting and dismounting guns, driving piles, etc.

Gyp. A strong gasp for breath, like that of a fish just taken out of the water.

Gyver. An old term for blocks or pulleys.

Gyves. Fetters; the old word for handcuffs.

H.

H. Abbreviation for *have* in the U. S. General Service Signal Code. Among the letters used in the log-book to register the state of the weather, *h* denotes *hail.*

Haaf. Cod, ling, or tusk deep-sea fisheries of the Shetland and Orkney islanders.

HAAF-BOOT. One fitted for deep-water fishing.

Haak. See HAKE.

Habeas Corpus (Lat. *You may have the body*). In law, the name given to a variety of writs (in the ancient forms of which these were the emphatic words) having for their object to bring a party before a court or judge. The most celebrated of these is the writ (*Habeas corpus ad subjiciendum*) to inquire into the cause of a person's imprisonment or detention with a view to obtain his or her liberation.

Hack. A word applied to a watch or chronometer used in taking observations, to obviate the necessity of moving the standard chronometer.

Hackatee. A fresh-water tortoise having a long neck and flat feet, and weighing from 10 to 15 pounds, which is found in the West Indies.

Haddock. The *Gadus æglefinus*, a species of cod fabled to bear the thumb-mark of Saint Peter.

Hag. An eel-like fish (the *Gastrobranchus* (*Myxine*) *glutinosus*) having a cartilaginous skeleton, a ring-like mouth, a strong tooth in the palate, and two rows of teeth, by which it enters other fishes and devours them. It is about 5 or 6 inches long, and is allied to the lamprey. It is found in polar seas.

Hag-boat. See HECK-BOAT.

Hag's Teeth. Those parts of a matting or pointing interwoven with the rest in an irregular manner, so as to break up the uniformity.

Haik. See HIKE.

Hail. To call, to accost; thus one vessel *hails* another at sea, the customary form being "Ship ahoy!" A sentinel *hails* when he challenges. A ship is said to *hail* from the port to which she properly belongs; a man, to *hail* from the country of his birth or residence. *Pass within hail,*

a special signal to approach and receive orders or intelligence, when boats cannot be lowered or time presses. *Hail fellows*, congenial messmates.

HAIL-SHOT. Small shot for cannon.

Haimura (*Erythrinus macrodon*). A large fresh-water fish of Guiana, highly esteemed for the table.

Hair-bracket. The molding which terminates the fore ends of the head-rails, and comes at the back of the figure, and breaks in fair with the upper deck.

Hair-tail (*Trichiurus*). A genus of acanthropterous fishes, sometimes classed in the Ribbon-fish family, but more generally referred to the family *Scomberidæ*. In Cuba it is known as the *sabre-fish*, and in other parts of the world as the *blade-fish*.

Hair-trigger. A trigger whose movement is effected by a very slight force. Its action is communicated to the tumbler-catch by means of a device called a *hair*.

Hake. An old term for a hand-gun. Also the fish *Gadus merlucius*, a gregarious and voracious fish of the cod family, termed also *sea-pike*.

Hake's Teeth. A term for the *Dentalium*, a species of shell-fish whose presence in the British Channel serves as a guide to pilots in foggy weather. Also, a phrase applied to some parts of the deep soundings in the British Channel.

Halcyon Piscator. A bird of the king-fisher kind, so called from its supposed identity with the halcyon of antiquity. The ancients called the seven days that precede and follow the winter solstice *halcyon days* from the circumstance of the halcyon selecting that period for incubation. While this process was going on the weather was generally remarkable for its calmness. And hence the expression has passed into a proverb, signifying days of peace and tranquillity.

Hale. An old word for *haul*.

Half-beam. A beam which is of the same size as the ordinary deck-beams, and is cut off for some reason, as a long hatch, and which does not as a consequence extend clear across the ship.

Half-breadth of the Rising. A term used in the mold-loft, it being the distance beveled out from the centre-line taken at a mark which is at or near the head of the floor-timbers, and afterwards applied to the mold, and is used in the framing of the ship.

Half-breadth Plan. That on which is shown the form of the vessel by horizontal and diagonal longitudinal sections.

Half-cock. The position of the hammer of a fire-arm intermediate between those which it has when resting on the nipple, or firing-pin, and when drawn back to full cock. Arms should be habitually carried at half-cock, as in that state they are less liable to be accidentally discharged. *Going off at half-cock*, a metaphorical expression for speech, or action, which fails of effect because uttered, or taken, without due forethought or preparation.

Half-davit. A name for the *fish-davit*.

Half-deck. The portion of the gun-deck included between the mainmast and the cabin-bulkheads.

Half-floor. An expression used in the mold-loft to indicate the spoint at which the dead-rise of the ship is taken, which is at one-quarter of the breadth of the ship from the centre-line. Sometimes, in a wooden ship, floor-timbers are made, where the shape is difficult, in two pieces, and they are scarfed, tabled, and bolted together.

Half-hitch. A hitch formed by passing the end of a rope around the standing part and bringing it up through the bight.

Half-laughs and Purser's Grins. Hypocritical and satirical sneers.

Half-man (*Eng.*). A rating in coasters for a boy or landsman.

Half-mast. To lower a flag midway between the truck and deck, as a mark of respect for the dead. When flags are half-masted they are not hauled down from that position, but are run close up as the call is beaten.

Half-minute Glass. A time-glass used in logging a ship. A glass that runs 28 seconds is generally used as being more convenient.

Half-pay. A term with which we are more familiar in the pages of fiction than as a matter of fact. In English novels the half-pay officer is a frequent character, but in this country the expression describes nothing known to either our military or naval system. Even in England and other countries employing the term, or its equivalent, it is not confined to its literal meaning, but is used to signify a money allowance, less in amount—though not always to the extent of one-half—than the full pay of the officer receiving it. This allowance, in England, has not the same character in both services. In the royal navy it is the allowance, usually about 60 per cent. of the full pay, made to all officers not immediately wanted afloat; and as there are always many more officers, than appointments for them to fill, a considerable number are at all times on the half-pay list, and the expression thus becomes descriptive of a regular and recognized condition. In the British army, on the other hand, half-pay is a temporary grant either to officers thrown out of employment by the reduction of the corps with which they are serving, or those compelled to quit active duties by sickness, and is thus pertinent to a casual rather than a regular condition. The first grant of army half-pay was made by William III. in 1698.

Half-pike. An iron spike fixed on the end of a short ashen staff, used in repelling the assaults of boarders.

Half-port. The ports are fitted with heavy shutters having a circular hole to receive the gun when it is run out. These ports are made in two pieces, each piece being called a *half-port;* and when in action the upper one is passed inboard or triced up, and the lower one is lowered. In port, during fine weather, they are kept parallel with the water.

Half-sea. An old term for mid-channel. *Half-seas over*, moderately drunk.

Half-tide Rocks. Rocks awash at the middle of the tide.

Half-timbers. Those timbers in the cant bodies which are answerable to the lower futtocks in the square bodies.

Half-top. See TOP.

Half-topsails Under. An expression to signify that a vessel is so far distant that she is below the horizon with the exception of that portion

of her spars and sails from the middle of the topmast up.

Half Watch-tackle. A luff-purchase.

Halibut (*Hippoglossus vulgaris*). One of the largest kinds of flat-fish, found in great numbers on the Atlantic coast, and much esteemed as food, its flesh being firm and white, though somewhat dry. It is found on the British coast, but more abundantly in the northern than the southern parts. The Greenlanders use it extensively, and obtain oil from it in considerable quantities.

Halifax. A city and seaport, capital of Nova Scotia. Lat. 45° N.; lon. 63° 35′ W. Situated on the west side of Chebucto Bay, now called Halifax Harbor. The city contains many large and handsome buildings, among which can be numbered the provincial buildings, military and naval hospitals, barracks, and military jail. At the northern end of the city is the royal dock-yard, covering 14 acres, the finest in the British colonies. The harbor is 6 miles long by 1 in width, with excellent anchorage in every part of it, and at the north end it is connected with Belford Basin, 6 miles by 4 in size, capable of containing all the navies in the world. The city is protected by 11 fortifications, and is the chief naval station of British North America. Pop. 32,500.

Halley's Chart. The chart showing, by curves, the variation of the compass.

Halliards, Halyards, or Haulyards. The rope or purchase employed to hoist a yard or sail on its mast or stay. All yards have halliards except the lower,—these being kept stationary ordinarily; when they are hoisted or lowered the jeers are used.

Topsail-yards have a permanent purchase, variously rigged according to the size of the yard. *Top-gallant* and *royal* yards are hoisted by means of the yard-rope, a tackle being clapped on abaft the mast. *Jib-* and *stay-sail*-halliards are bent to the head-cringles of their respective sails, and lead thence along the stay to a block under the collar of the stay, and down to the deck; they are sometimes rove double, in which case there is a block at the head of the sail, the standing part being seized to the collar of the stay. *Studding-sail* halliards are bent to the studding-sail yard, and reeve through a block at the yard-arm, thence through a block on the mast, and down to deck; the fore clew-jigger is used as the *inner* halliards. *Throat-* and *peak*-halliards are used on gaffs, the former hooked to the jaws, and the latter to the peak. *Gaff-topsail* halliards are rove through a sheave on the mast, and are bent to the yard or head-cringle of the gaff-topsail. *Crow-foot* halliards reeve through a block on the lower stay, and are bent to the crow-foot on the awning. *Signal*-halliards, light lines extending from the deck to the trucks or gaff-ends; used for hoisting signal-flags. *Ensign*-halliards, the line by which the colors are run up to the peak or flag-staff. *Smoke-stack* halliards, Jack's term for the hoisting apparatus of the smoke-stack.

Halo. A luminous ring encircling the sun or moon, whose light passing through the intervening vapor gives rise to the phenomenon. Halos are termed *lunar* or *solar* according as they appear around the moon or sun. The lunar halo is simply a white, luminous circle without color excepting a pale red, which sometimes fringes the interior edge of the circle. Solar halos are prismatically colored. See CORONA, PARHELIA.

Halse, or Halser. Archaic spelling of *hawser*.

Halve-net. A net to prevent fishes from going out with the falling tide.

Halyards. See HALLIARDS.

Hamac. Columbus found that the inhabitants of the Bahama Islands had for beds nets of cotton suspended at each end, which they called *hamacs*, or *hamacas*,—whence *hammock*, a name since adopted universally among seamen. See HAMMOCK.

Hambroline. A superior sort of small stuff used for seizings.

Hamburg, one of the principal cities of Germany, is situated on the right bank of the Elbe, about 70 miles from its mouth. Lat. 53° 33′ 7″ N.; lon. 9° 58′ 23″ E. Its manufactories comprise sugar-refineries, tar, tobacco, and sail-cloth factories, ship-yards, anchor and iron forges, etc. It is the greatest commercial city of the European continent, its trade being chiefly with Great Britain and America, and its many first-class steamers are constantly running to New York, the West Indies, South America, and the Mediterranean. The channel of the Elbe has been improved, so that vessels drawing 18 feet of water can reach the city at high tide. Pop. 264,850.

Hamel. The star *α Arietis*.

Hammer. That appendage of the lock of a fire-arm which, being first drawn back to the position of "cock," is, by the operation of the trigger and internal mechanism of the lock, sprung down upon the cap, or against the firing-pin or percussion-cartridge, with such force as to explode the fulminate and to cause the discharge of the piece.

Hammer-headed Shark (*Zygœna malleus*). An extremely ugly fish of the Shark family, distinguished by the extraordinary form of its head, which in the adults resembles a double-headed hammer, being extended on both sides to a considerable length and having the eyes at the ends of the lateral extensions. The mouth is below the centre of the head. In the young the hammer-headed form is not so perfect.

Hammock. A suspended bed invented by Alcibiades; the name is derived from *hamac* (which see). It consists of a strip of canvas about 3 feet wide and 6 feet long, to the ends of which are attached combinations of small cords, called *clews*. When suspended, this canvas forms a receptacle for a mattress and blanket; when not in use, the canvas is wrapped tightly around the bedding and bound with a lashing and stowed in the nettings. Each man on board ship has two hammocks, the one not in use being kept clean and stowed away in the sail-room; the watch number of the owner is stenciled on the hammock, and also on a tin tag hung over the proper hook. *Up all hammocks*, the order to take the hammocks on deck and stow them in the nettings. *Down all hammocks*, the order to lash the hammocks and stow them below, when for any reason, such as rain, they cannot be taken on deck. *To sling a hammock*, to bend the clews and get it ready for use. *To swing a hammock*, to hang it up on the hooks.

HAMMOCK-CLOTH. A painted canvas cover over the netting to protect the hammocks from the weather.

HAMMOCK-GIRTLINES. Lines extending from the jib-boom to the spanker-boom, on which scrubbed hammocks are stopped to dry.

HAMMOCK-NETTINGS. Receptacles on the rail for hammocks when not in use. They were formerly formed of net-work, hence the name. They are now boarded in.

HAMMOCK-STANCHIONS. Iron stanchions fixed on the main-rail or plank-sheer, having a forked end to which the hammock-rails are secured.

Hamper. Articles which, though ordinarily indispensable, are a great inconvenience at certain times. See TOP-HAMPER.

Hamron. An archaic term meaning the hold of a ship.

Hance. A sudden fall or break.

Hand. An adjective applied to anything worked by hand. A man; one of the crew. *All hands*, everybody. *Bear a hand*, to make haste. *Lend a hand*, to assist. *Hand-over-hand*, hauling rapidly upon any rope, by passing the hands alternately one before the other, or one above the other if hoisting. A sailor is said to go *hand-over-hand* if he lifts his own weight and ascends a single rope without the help of his legs. *Hand-over-hand* also implies *rapidly;* as, we are coming up with the chase hand-over-hand. *Hand-under-hand*, the manner of descending a rope, the weight of the body being sustained by the arms only. *Hand-taut*, as taut as can be hauled by hand. *To hand* a sail, to furl it.

HAND FEED-PUMP. A feed-pump provided with brakes so as to enable it to be worked by hand independent of other motive force.

HAND-GEAR. An appliance for manipulating a steam-engine or other machine when automatic action is not desired.

HAND-GRENADE. A shell, weighing about 2 pounds, thrown from the hand. The fuze being previously lit, the shell is conveniently thrown from the tops on to an enemy's deck, from the parapet into the ditch, or generally against an enemy otherwise hard to reach. Ketchum's hand-grenade is a small oblong percussion-shell, which explodes on striking the object.

HAND-GUN. An old term for small-arms in the times of Henry VII. and VIII.

HAND-HOLE. A small elliptical or triangular hole in any convenient part of the shell of a steam-boiler; used for cleaning and repairing the structure and withdrawing scale or sediment from the interior. It is covered by a *hand-hole plate*.

HAND-LEAD. A small lead used for sounding in shallow water.

HANDMAID. An old denomination for a tender; thus, in Drake's expedition to Cadiz, two of her Majesty's pinnaces were appointed to attend his squadron as *handmaids*.

HAND MAST-PIECE. A small hand mast-spar.

HAND MAST-SPAR. A round mast; those from Riga are commonly over 70 feet long by 20 inches diameter.

HAND-PUMP. The common movable pump for obtaining fresh water, etc., from tanks or casks.

HAND-SAW. The smallest of the saws used by shipwrights, and used by one hand.

HAND-SCREW. A handy kind of single jack-screw.

HANDSPIKE. A short wooden lever for moving heavy articles, as guns.

HANDSPIKEMAN. One of a gun's crew who handles the handspike in great-gun drill.

Handle. The title prefixed to a person's name. *To handle a ship well* is to work her in a seaman-like manner.

Handsomely. Slowly; steadily; carefully.

Handy, Robert, Commodore U.S.N. Appointed a midshipman from Rhode Island, February 1, 1826; sloop "John Adams" and frigate "Constellation," West India Squadron, 1826–27; frigate "Hudson," Brazil Squadron, 1828–31.

Promoted to passed midshipman, April 28, 1832; survey of Narragansett Bay, 1832; sloop "Vincennes," Pacific Squadron, 1833–35; frigate "Brandywine," Pacific Squadron, 1835–37.

Commissioned lieutenant, March 8, 1837; sloop "Erie," Home Squadron, 1838; navy-yard, Boston, 1838–40; steamer "Fulton," special service, 1841–42; sloop "Levant," Pacific Squadron, 1843–47; receiving-ship, Boston, 1847–48; navy-yard, Boston, 1848–52.

Commissioned commander, September 14, 1855; commanding rendezvous, Boston, 1858–61; commanding "Vincennes," Gulf Squadron, 1861; commanding "Dale," East Gulf Blockading Squadron, 1863–65. Retired, 1862.

Commissioned commodore, March 13, 1867.

Handy-billy. A small jigger used for various purposes about the decks, in the tops, holds, etc.

Handy Ship. One that works easily.

Hang. To droop in the middle part. To linger; to stop temporarily; as, a vessel *hangs* on the ways. To incline; as, a mast *hangs* aft. To support temporarily from above; as, to *hang* the bight of a chain. *To hang on*, to persevere; to continue. To throw the whole weight on a rope or tackle; to hold on. The hanging of sheer-strakes and decks is the declining in the centre of the length fore and aft, from a level or horizontal line.

HANG FIRE. When there is an unusual slowness in the ignition of the gunpowder of a piece or train it is said to *hang fire*. Used figuratively to indicate hesitation.

HANGING-BLOCKS. Blocks under the eyes of the fore-topmast rigging, through which reeve the jib- and stay-sail-halliards.

HANGING-BRIDGE. An inverted *fire-bridge* or *bridge-wall*, placed in a furnace or flue for the purpose of deflecting the flame and other products of combustion downwards. See FIRE-BRIDGE.

HANGING-CLAMP. A semicircular iron with a foot at each end by which it is secured to any part of the ship to receive nails; it is not often used nowadays.

HANGING-COMPASS. A tell-tale; a compass so constructed and swung as to hang with the card downwards.

HANGING-KNEES. Those knees against the sides and beams whose bodies are perpendicular and whose arms extend under the beams at right angles with the bodies of the knees.

HANGING-STAGE. A stage rigged outside the ship, supported by ropes from above.

HANGING STANDARD-KNEES. Vertical curves employed generally with the orlop beams; they are fastened on each side against the vertical side of the beam, and on the other side against the ship's sides; thus they differ from those which are simply called standard.

HANGING-STOVE. A vessel suspended from a beam and containing fire for drying the decks.

Hank. A ring of rope, wood, or iron, running on a stay, and to which is seized the luff of a stay-sail. Also, a skein of line or twine. *Hank-for-hank*, an expression to denote that anything is done slowly and laboriously.

Han-Kow. A city and one of the treaty ports of China, on the Yang-tse-Kiang, at the mouth of one of its tributaries, and 700 miles from the sea. The city, with Han-Yang and Woo-Chang, the capital of Hoo-Pe, all in sight of one another, separated only by the river, forms one of the greatest commercial centres of the world. Lat. 30° 30′ N.; lon. 114° E.

Happy-go-lucky. An expression to signify a reckless reliance on chance.

Haque. A small hand-gun of former times.

Haquebut. A larger sort of hand-gun than the haque; an arquebuse.

Harbor. A general name for any safe port. The requisite qualities of a good harbor are, that it should afford security from the effects of wind and sea; the bottom should be free from rocks, wrecks, and shoals, and the holding-ground should be good; the opening should be sufficient to permit the entrance and departure of the largest vessels at all stages of the tide; there should be suitable establishments for the repairing and refitting of vessels; a sufficient number of warping-buoys should be planted; it should be well surveyed, well lighted, and well defended; and water, fuel, and provisions should be abundant and convenient. Such a harbor, if used as a place of commercial transactions, is called a port.

HARBOR-DUES. See PORT-CHARGES.

HARBOR-GASKET. See GASKET.

HARBOR-MASTER. An officer appointed to inspect the moorings, and to see that the ships are properly berthed, and the regulations of the harbor strictly observed by the different ships frequenting it.

HARBOR-REACH. The reach or stretch of a winding river which leads direct to the harbor.

HARBOR-WATCH. See ANCHOR-WATCH.

Hard. Firm; solid. Vehemently; with force. Cruel; oppressive. Inflexible; unyielding. Distressful; unprofitable. The word *hard* applied to the helm means "to the extreme limit." See HELM.

HARD BARGAIN. A useless officer; a skulking seaman.

HARD FISH. A term applied to cod, ling, haddock, etc., when salted and dried.

HARD-HEAD. The *Clupea menhaden*, an oily fish, taken in immense quantities and used for manuring land. The name is sometimes given to the sea-scorpion and the gray gurnard.

HARD-HORSE. A tyrannical officer.

Hards. See ACUMBA.

Harle. Mists or thick rolling fogs from the sea. Also a name of the goosander, *Mergus mergauser* (which see).

Harlequin Duck (*Clangula histrionica*). A species of garrot which receives its name from its variegated markings. It is found in the arctic regions, and in winter comes as far south as the Bay of Fundy.

Harmattan. A Fantee name for a singular periodical easterly wind which prevails on the west coast of Africa, generally in December, January, and February; it is dry, though always accompanied by haze, the result of fine red dust suspended in the atmosphere and obscuring the sun; this wind is opposed to the sea-breeze, which would otherwise blow fresh from the west on to the land.

Harmony of the Spheres. The ancients supposed the motions of the stars and planets to produce a kind of music, which they called the *harmony of the spheres*.

Harness. An old term for the furniture of a ship.

Harness-cask. A large conical tub for containing the salt provisions intended for present consumption. Alluding to the beef, which is often called salt-horse, it has been described as the tub where the horse, and not the harness, is kept.

Harp-cock. An old modification of the harpoon.

Harpins. A continuation of the ribbands at the fore and after extremities of the ship, fixed to keep the cant-frames, etc., in position until the outside planking is worked.

Harpoon, or Harpago. A spear or javelin with a barbed point, used to strike whales and other fish. The harpoon is furnished with a long shank, and has at one end a broad and flat triangular head, sharpened at both edges so as to penetrate the whale with facility, but blunt behind to prevent its cutting out. To the other end a fore-ganger is bent, to which is fastened a long cord called the whale-line, which lies carefully coiled in the boat in such a manner as to run out without being interrupted or entangled. Several coils, each 130 fathoms, of whale-line (soft laid and of clean silky fibre) are in readiness; the instant the whale is struck the men cant the oars, so that the roll may not immerse them in the water. The line, which has a turn round the bollard, flies like lightning, and is intently watched. One man pours water on the smoking bollard, another is ready with a sharp ax to cut, and the others see that the line runs free. Seven or eight coils have been run out before the whale "sounds," or strikes bottom, when he rises again to breathe, and probably gets a similar dose.

HARPOON, GUN-. A weapon used for the same purpose as the preceding, but it is fired out of a gun, instead of being thrown by hand; it is made entirely of steel, and has a chain or long shackle attached to it, to which the whale-line is fastened. Greener's harpoon-gun is a kind of wall-piece fixed in a crutch, which steps into the bow-bollard of the whale-boat. The harpoon projects about four inches beyond the muzzle. It consists of its barbed point attached to a long link, with a solid button at its opposite end to fit the gun; on one rod of this link is a ring which runs to the muzzle, and is there attached to the whale-line by a thong of seal- or walrus-hide, wet. The gun being fired, the harpoon is projected, the ring sliding up to the button, when the line follows. Some of these harpoons or other engines have grenades, —glass globules with prussic acid or other chemicals, which sicken the whale instantly, and little trouble ensues.

HARPOONER, HARPONEER, or HARPINEER. The expert bowman in a whale-boat, whose duty it is to throw or fire the harpoon.

Harp-seal. The *Phoca grœnlandica*, a species of seal from the Arctic seas; so called from the form of a dark-brown mark upon its back.

Harp-shell (*Harpa*). A genus of gasteropodous mollusks of the whelk family. The shells are much prized on account of their great beauty.

Harr, or Harl. A cold, thick mist or fog in easterly winds; the *haar*.

Harriot, Thomas. A man of high repute as an algebraist and astronomer. He accompanied the expedition to Virginia, under Sir Richard Grenville, in 1585, and wrote an interesting account of its transactions. He made a careful examination of the natural productions of the Carolinas and Virginia, and was the first to introduce tobacco and the potato to the knowledge of Europe. Harriot tried also to explain the doctrines of the Bible to the Indians of America, but because of the little community of language between the two races his missionary efforts were unproductive.

Harrison, Napoleon B., Captain U.S.N. Born in Virginia, February 19, 1823; died at Key West, Fla., November 1, 1870. Midshipman, February 26, 1838; lieutenant, January 6, 1853; commodore, July 16, 1862; captain, April 28, 1868. Served in California during the Mexican war; commanding "Cayuga," flag-ship of Capt. Bailey, and led the line in passage of Forts Jackson and St. Philip to the city of New Orleans, and specially commended for gallantry and skill in official reports; commanding steamer "Mahaska" in James River Flotilla; steam-frigate "Minnesota," North Atlantic Blockading Squadron, 1862–63; attached to South Atlantic Blockading Squadron, 1863–65, and took part in the operations on the South Carolina coast up to the fall of Charleston; commandant of midshipmen, Naval Academy, Annapolis, 1868–69.

Harry-net. A net with such small meshes and so formed as to take even the young and small fish.

Hartlepool, Durham County, England, 19 miles E.S.E. of Durham, is situated on an isolated promontory on the North Sea. The promontory curves so as to form a natural harbor, and presents from its high and singularly excavated cliffs magnificent sea and land views. It has a large export trade in coals, and imports Baltic produce, wools, and other staples. Pop. 13,200.

Hartstene, Henry. Born in South Carolina; died in Paris, March 31, 1868. Midshipman, April 1, 1828; lieutenant, February 23, 1840. He was in 1851 attached to the coast survey, and afterward commanded the mail-steamer "Illinois." In 1855 he was sent to the Arctic regions in search of Dr. Kane and his party, whom he rescued and brought to New York. In 1856 he was ordered to convey to England the British exploring-bark "Resolute," which, after having been abandoned in the Arctic ice, had been rescued by a New London whaler, and purchased of her salvors by Congress as a present to the British government. He was afterwards employed in taking soundings for the Atlantic telegraph cable. At the outbreak of the civil war he resigned, entered the Confederate navy, and in the summer of 1862 became insane.

Harvest-moon. The full moon nearest the autumnal equinox, when for several successive evenings she rises at the same hour; this name is given in consequence of the supposed advantage of the additional length of moonlight to agriculture.

Harwich. A seaport town in Essex County, England. The harbor is among the best on the east coast of England, and is defended by a strong fort and battery. Considerable ship-building is carried on, and it has large manufactories of cement. Pop. 6100.

Harwood, Andrew Allen, Rear-Admiral U.S.N. Born in Pennsylvania, and appointed midshipman from same State, January 1, 1818; served in the gun-brig "Saranac," on the Amelia Island Station, 1818; sloop-of-war "Hornet," 1819–21, during which time said ship was chiefly engaged in cruising for the suppression of the African slave-trade, and of piracy in the West Indies; navy-yard, Philadelphia, and receiving-ship "North Carolina," in 1822; steamer "Sea-Gull" and barges belonging to the expedition under Commodore Porter, against the West India pirates, 1823; on July 3, of that year, assisted in the capture of the piratical schooner "Catalina," of 3 guns, and her barge, by the barges "Gallinipper" and "Musquito" in Signapa Bay; frigate "Constitution," in the Mediterranean, 1824–27,—in the latter part of this service as acting master.

Commissioned as lieutenant, March 3, 1827; receiving-ship, Philadelphia, 1828–30; navy-yard, New York, 1831–32; frigate "United States," Mediterranean Squadron, 1832–33; detached as special messenger to bring home the ratified treaty with Naples; frigate "Potomac," schooner "Shark," and frigate "Constitution," Mediterranean Squadron, 1835–37; New York Station on special service, 1840–43; assistant inspector of ordnance, 1843–52; in 1844, member of a commission to visit dock-yards and foundries in England and France, and report on ordnance improvements.

Commissioned as commander, October 2, 1848; in 1851–52, member of a board appointed to prepare the ordnance instructions for the navy, and to make the necessary investigations and experiments; commanded frigate "Cumberland," Mediterranean Squadron, 1853–55.

Commissioned as captain, September 14, 1855; inspector of ordnance, 1858–61; member of a board to revise the ordnance instructions, and prepare a new edition.

Commissioned as chief of the Bureau of Ordnance and Hydrography, August 6, 1861.

Commissioned as commodore, July 16, 1862; commandant navy-yard, Washington, and of the Potomac Flotilla, 1862–63; secretary Light-House Board, and member of Examining Board, 1864–69.

Commissioned as rear-admiral, February 16, 1869; member of Retiring Board and on special duty at Washington, 1869–72; retired October 9, 1864.

Hasega. A corruption of *asseguay*.

Hask. An archaism for a fish-basket.

Hasp. A semicircular clamp turning in an eye-bolt in the stem head of a sloop or boat, and fastened by a forelock in order to secure the bowsprit down to the bows.

Hastan. The term for a large eel or conger.

Hastings. One of the Cinque Ports of England, in Sussex County, on the English Channel. The town formerly had an extensive trade, fine

docks, and ship-yards, but is now chiefly noted as a bathing-place. Pop. 29,500.

Hasty-pudding. A batter made of flour or oatmeal stirred in boiling water, and eaten with molasses or sugar.

Hatch. A half door. A contrivance for catching salmon. Any aperture in the deck, more than two feet square; a hatchway. A covering for a hatchway. *To batten down the hatches*, to place tarpaulins over them and secure the tarpaulins with nails and battens. *Under hatches*, a term for being under suspension or arrest,—applied to officers.

Hatch-boat. A sort of small vessel known as a pilot-boat, having a deck composed almost entirely of hatches.

Hatch-rings. Rings to lift the hatches by, or replace them.

Hatchway. See HATCH.

HATCHWAY-STOPPER. See STOPPER.

Haul. To pull; to drag. The wind *hauls* when it changes its direction with the sun. A ship is *hauled up* when her course is so changed that her head lies nearer the wind. A ship *hauls her wind* when from sailing large she is brought by the wind. *To haul off*, to remove to a greater distance. *To haul aboard a tack*, to bring the weather-clew of a course down to the tack-block; to set the sail.

HAUL-BOWLING. An old name for an able-bodied seaman.

HAULING-DOWN VACANCY (*Eng.*). The colloquialism expressive of the promotion of a flag-lieutenant and midshipman on an admiral's hauling down his flag at the expiration of a cruise. This custom is now obsolete.

HAULING-LINE. A light line sent down from a yard, top, etc., to which a small article is bent to be hauled up.

HAUL-YARDS. See HALLIARDS.

Haunch. A sudden fall or break, as from the drifts forward and aft to the waist. The same as *hance*.

Havana. The capital city of Cuba, the largest of the West Indies group of islands. Lat. 23° 9′ 4″ N.; lon. 82° 22′ W. Pop. 206,000. The harbor is capable of holding a thousand large ships, and is defended by the Morro and Punta castles and other fortifications. Havana is chiefly noted for its cigars, which have universal celebrity. The trade is mainly with the United States, and steamers ply constantly between Havana, New York, New Orleans, Galveston, Baltimore, and Philadelphia.

Haven (Anglo-Saxon, *hæfen*). A safe refuge from the violence of wind and sea; much the same as harbor, though of less importance. A good anchorage rather than a place of perfect shelter.

Havenent. A small haven.

Haven-screamer. The sea-gull, called *hæfen* by the Anglo-Saxons.

Havre, in Seine-Inférieure, France, at the entrance of the Seine into the English Channel. Lat. 49° 29′ 16″ N.; lon. 0° 6′ 9″ E. The fortifications are very extensive and complete. The harbor contains five large basins, not including the outer port. Among the principal institutions are a school of navigation and one of geometry as applied to the arts. A great number of sailing-vessels and steamers are fitted out at the building-yards here. Havre is the port of Paris, and regular lines of steamers ply between here and New York, Havana, Brazil, Calcutta, and China. Pop. 92,100.

Hawke, Edward (Baron). A British admiral of high repute. Before he had completed his twentieth year his talent and conduct procured him the command of a ship. At Toulon, in 1749, he broke the line of a Spanish fleet and captured one of the ships of the enemy. But as in this he had violated orders he was sentenced to dismissal by a court-martial. George III. restored him, as he was too valuable an officer to be turned adrift for an error in judgment. Naval history credits Hawke with two or three victories over the French, the most remarkable of which was gained in Quiberon Bay. An invasion of England was meditated in 1759, but Hawke, by his promptitude and daring, anticipated the event. He rose to be a vice-admiral, first lord of the Admiralty, and a member of the peerage.

Hawk's-bill (*Chelone imbricata*). A well-known turtle frequenting the Atlantic and Indian Oceans, so named from having a small mouth like the beak of a hawk; it produces the tortoise-shell of commerce. The flesh is indifferent, but the eggs very good.

Hawse. The situation of the cables when the ship is moored with an anchor on each bow. That portion of a vessel's bow through which the hawse-holes are cut. *In the hawse*, or *athwart the hawse*, a short distance in advance of the cut-water. A ship has a *bold hawse* when the hawse-holes are high out of water. *To freshen the hawse*, to veer out a little more cable and bring the chafe and strain on another part. To ride *hawse-fallen* is to ride at anchor with the water coming in at the hawse-holes carrying everything before it. Riding *hawse-full*, pitching bows under. The hawse is *clear* when both chains lead direct to their respective anchors, and either anchor can be picked up without fouling. When the hawse is clear, and the ship brings a strain on both chains, her head bisecting the angle between them, the hawse is *open*. When the chains are so crossed or intertwined that the hawse must be cleared before the anchors can be hove up, the hawse is *foul*. If from an open hawse a ship swings 180° she brings a *cross* in the hawse, a second half-swing in the same direction makes an *elbow*, a third, a *round turn*, a fourth, a *round turn and an elbow*, and so on. The hawse should be cleared before the turns accumulate to such a degree as to render the operation difficult. In the days of rope-cables, clearing hawse was a tedious operation, but chain-cables, with their shackles at every 15 fathoms, enable it to be done much more rapidly. A cross cannot be cleared; when unmooring in such a case the anchor to the under chain must be hove up first; if necessary to heave up the other anchor first, one of the chains must be unshackled and *dipped*. If the mooring-swivel be used, the hawse never gets foul, but there are some objections to its use. See MOORING-SWIVEL.

HAWSE-BAG. A canvas bag filled with oakum, used in heavy seas to stop the hawse-hole and prevent the water coming in. See JACK-ASS.

HAWSE-BLOCK. A buckler or piece of wood made to fit over the hawse-hole when at sea to back the hawse-plug.

HAWSE-BOLSTER. Pieces of oak timber fayed to the curvature of the bow under the hawse-

holes to prevent the cables from damaging the lower cheeks. They are generally ironed.

HAWSE-BOXING, or NAVAL HOOD. Hawse-boxing is not used nowadays; it was formerly a projection left upon the hawse-timbers in the wake of the hawse-holes, the thickness of the planking inside and outside against which the planking butted. The purpose of boxing is now answered by the use of a lead pipe turned down and secured inside and outside.

HAWSE-BUCKLER. See BUCKLER.

HAWSE-FULL. *Riding hawse-full*, pitching bows under.

HAWSE-HOLES. The holes at the fore part of the ship through which the cables pass.

HAWSE-HOOK. The breast-hook over the hawse-holes.

HAWSE-PIECES. Pieces in the frame, to the number of from three to six, next aft of the knight-heads, through which the hawse-holes are cut.

HAWSE-PIPES. Iron pipes fitted in the hawse-holes to prevent the cable from cutting the wood; a lead lining is placed under the iron pipes.

HAWSE-PLUG. A block of wood made to fit into the hawse-pipe, and put in from the outside to stop the hawse, and thereby prevent the water from washing into the manger. The plug, coated with old canvas, is first inserted, then a mat or swab, and over it the buckler or shield, which bolts upward and downward into the breast-hooks.

HAWSE-TIMBERS. The upright timbers through which the hawse-holes are cut.

HAWSE-WOOD. A general name for the hawse-timbers.

Hawser. A rope 11 inches or less in circumference, being composed of three plain-laid ropes laid up left-handed. Plain-laid ropes of corresponding sizes are called *tow-lines.*

HAWSER-LAID ROPE. Cable-laid, or 9-stranded left-handed rope. In England, hawser-laid rope is 3- or 4-stranded right-handed rope.

Haye. A peculiar ground shark on the coast of Guinea.

Hayler. An archaism for halliards.

Haze. A light mist.

Head. The upper part of anything; as, mast-head, timber-head, etc. An ornamental figure at the bow of a ship; as, figure-head, scroll-head, etc. Also, in a more extensive sense the whole fore part of a ship. The name is also applied to that portion of a ship, on each side the bowsprit, which is set apart for the convenience of the ship's company. The upper part of a gulf, bay, etc. The wind *heads* a ship when it causes her to break off from her course. A ship is trimmed *by the head* when she draws more water forward than aft. A ship *heads* in the direction marked out by her keel.

In mechanics, the height of the surface of a confined liquid of uniform density above any point at which its static or dynamic effect, such as pressure against the confining structure or the velocity of flow of an issuing stream, are observed or applied, as, for instance, the water-pressure at any part of a ship's side or bottom, or the flow of water from a flume to a water-wheel. The pressure upon any stated surface is due to the weight of a column of the liquid having an area of base equal to such surface, and a height equal to that of the head; and the velocity of flow may, by neglecting the resistance of friction, contracted vein, etc., be computed by the well-known formula $v = \sqrt{2gh}$, where $v =$ velocity, $g =$ gravity acceleration, and $h =$ the height.

Head of steam commonly refers to the pressure of steam above that of the atmosphere. It may, however, in computations relating to velocity of outflow, etc., be considered as the height of an imaginary column of steam of uniform density due to the pressure, and of corresponding weight.

HEAD AND GUN MONEY (*Eng.*). An encouragement in the prize acts by which £5 a head is given to the captors for every person on board a captured vessel of war or pirate.

HEAD-BOARDS. Boards placed at the forward and after ends of the hammock nettings. The close boarding between the head-rails.

HEAD-CRINGLES. Earing-cringles at the upper clews or corners of a sail.

HEAD-EARING. See EARING.

HEADER. The person in the Newfoundland fishing-vessels who is engaged to cut open the fish, tear out the entrails, break off the head, and pass it over to the *splitter*, who sits opposite to him. A dive head foremost into the water.

HEAD-FAST. A rope or chain employed to fasten the head of a ship or boat to a wharf or buoy, or to some other vessel alongside.

HEAD-HOLES. The eyelet-holes in the head of a sail; they are worked button-hole fashion, over grommets of twine of several thicknesses.

HEAD-KNEE. The knee of the head, or the cut-water, may be defined as a continuation of the stem. It is fayed and bolted to the stem, and secured to the bows of the ship by strong knees, called cheek-knees. The heel is scarfed to the fore-foot, and it is also secured to the upper part of the stem by a knee which is called the lacing.

HEADLAND. Wherever the coast presents a high cliffy salient angle to the sea, without projecting far into it, it is called a headland; but if the point be low, it is a spit, tongue, or point.

HEAD-LEDGES. The athwart-ship pieces which frame the hatchways.

HEADMOST. The situation of any ship or ships which are the most advanced in a fleet, or line of battle. The opposite of *sternmost.*

HEAD-NETTING. An ornamental netting used in merchant ships instead of the fayed planking to the *head-rails.*

HEAD-PUMP. A small pump fixed at the vessel's bow, its lower end communicating with the sea; it is mostly used for washing decks.

HEAD-RAILS. Those rails which extend from the back of the figure-head to the bows.

HEAD-ROPE. That part of a bolt-rope which terminates any sail on the upper edge, and to which it is sewed.

HEAD-SAILS. A general name for all those sails which may be set on the bowsprit, jib, and flying jib-boom, and employed to influence the fore part of a ship.

HEAD SEA. A name given to the waves when they oppose a ship's course. Their effect depends upon their height, form, and speed; sometimes they are steep, quick, and irregular, so that a ship is caught by a second before she has recovered from the first; these render her wet and uneasy.

HEAD-SHEETS. The sheets of the head-sails.

HEAD-STICK. A short round stick with a hole at each end, through which the head-rope of some triangular sails is thrust before it is sewed on. Its use is to prevent the head of the sail from twisting.

HEAD-TIMBERS. Small timbers used in building up the head, situated on each side to receive the planking.

HEADWAY. A term to express the progress of a vessel in a forward direction.

HEAD-WIND. A breeze blowing from the direction of the ship's intended course.

HEAD-YARDS. The yards on the foremast.

Heald. The *heel* over of a grounded ship.

Heart. A small strand around which the four strands of shroud-laid rope are laid. A peculiar sort of block, having one large hole in the centre and a groove around the circumference. *Collar-hearts* are open at the end opposite the laniard.

HEART-YARNS. The centre yarns of a strand.

Hearty. Open and free. *My hearties*, a cheerful salute to shipmates and seamen in general.

Heath. Various broom-stuffs used in breaming.

Heave. To throw; to cast; to push; to cause to move by the application of force; to force from or into any position. *To heave short*, to haul in cable till the ship is nearly over the anchor. *To heave down*, to cause a vessel to careen by applying tackles to her masts. (See HEAVING DOWN.) *To heave to*, to bring a vessel's head to the wind and adjust the sails so she will remain stationary, or nearly so; to put a vessel in the position of *lying to*. *To heave in sight*, to come in sight. *To heave up*, to throw up; to vomit; also, to raise; as, to *heave up* the anchor. *To heave ahead*, to cause a ship to move forward by manual force. *To heave in stays*, to put a vessel about by tacking. *To heave about*, to put about suddenly. *Heave and aweigh*, an encouraging call implying that the next heave will break the anchor out. *Heave and awash*, implies that the next heave will bring the anchor in sight. *Heave and pawl*, an order to heave at the capstan till the next pawl drops. *Heave and rally*, an injunction to the men at the capstan to exert themselves. *Heave out*, turn out; to get out of bed. *Heave the lead*, to take soundings with the hand-lead. *Heave the log*, to determine the ship's velocity by means of the log-line and time-glass. *To heave in*, to shorten in the cable. *Heaving and setting*, the up-and-down motion of the waves, or the similar motion of a ship, produced by the waves. *Heaving through all*, the surging and slipping of the cable when the nippers do not hold.

Heaver. A short wooden bar used as a lever.

Heaving Down. The process of placing a vessel upon her side for the purpose of calking or repairing. This only becomes necessary when access to docking facilities cannot be obtained, and it is seldom resorted to at the present day except with the smaller class of vessels. The process is practicable with sailing-vessels only.

A vessel may be hove down or careened to a wharf or a hulk fitted for the purpose. Preparations must be made to prevent injury to the masts and hull by straining by removing all weights except such as may be required to assist in careening the vessel. All masts and yards above the lower masts must be sent down, and those which are not required for shoring or strengthening the lower masts taken out of the vessel. The decks must be supported by shores wherever they are to be subjected to unusual strain.

The wedges are removed from the masts, and the latter are carried over against the partners on the offshore side. The lower masts are supported by spars, which rest upon the water-ways on the inshore side of the deck, and are lashed to the trestle-trees. The deck underneath these shores must be supported, and shores should also be firmly wedged between the heels of the lower masts and the offshore or upper side, to prevent any strain at the step. Additional shrouds should be placed over the mast-heads and set up to convenient places on the vessel's side, as the gun-deck ports or the air-ports, and an equal strain must be placed upon all the shrouds. Hawsers or chains may also be used as shrouds by setting them up to heavy bolts driven into the side abreast of each mast, the angle of support being increased by means of outriggers or spars projecting through the ports. Arrangements must be made for pumping the water from the vessel while she is careened, and the seams, on the side which is to be immersed, should be calked to prevent leakage.

The vessel should be moored by cables passed under the bottom and secured through the spar-deck ports on the inshore side, and by hawsers at the bow and stern.

The upper blocks of the purchases are lashed to the mast-heads, and the lower blocks secured to the wharf. The distance between the latter must be the same as the distances between the upper blocks. A vessel with three masts requires purchases only on the foremast and mainmast, but preventer purchases should be used as a precaution against accident.

The mast-heads are hove down to the required position by means of capstans or other mechanical powers.—*E. T. Strong*, *Lieutenant U.S.N.*

Heavy. *Heavy metal*, guns of great calibre. *Heavy sea*, high and strong waves. *Heavy gale*, a violent storm blowing from 35 to 60 miles an hour; indicated by 11 on the Beaufort scale.

Heck-boat. The old term for a pink. Latterly a clincher-built boat with covered foresheets, and one mast with a trysail.

Heckle. To dress flax for rope-making. Also, an artificial fly for fishing.

Heckle-back. A name of the fifteen-spined stickleback (*Gasterosteus spinachia*).

Heda. An early term for a small haven, wharf, or landing-place.

Hedgehog. A name formerly applied to a vessel which rowed with many oars.

Heel. The part of a thing corresponding in position to the human heel; as, the after end of the keel, the lower part of a mast, bowsprit, etc. *To heel*, to lie over; to be inclined out of the perpendicular; usually applied to a ship when she has a list, caused by the force of the wind. *To have the heels of*, to be able to sail faster than. *To show the heels* (or *a clean pair of heels*), to outsail; to sail away from; to outstrip in a race or in a chase.

HEEL-BRACE. A piece of iron-work applicable to the lower end of the rudder in case of damage to the lower supports.

HEEL-KNEE. The knee that is bolted to the stern-post and keel; the stern-post knee.

HEEL-LASHING. A lashing to secure the inner end of a boom when it is rigged out.

HEEL OF THE POST. The name usually given to the after end of the ship's keel, as well as the lower end of the stern-post.

HEEL-POST. The post supporting the outer end of a propeller.

HEEL-ROPE. A line to the heel of a topgallant mast to assist in sending it down. A line attached to the heel of a boom to rig it out.

HEEL-TACKLE. A purchase hooked to the heel of a heavy boom to rig it out. A tackle to secure the heel of a sheer-leg in masting.

Height. *Height of the tide*, the difference in the level of high and low water,—the *range* of the tide. *Height of a wave*, the distance from the crest to the hollow. *Height of the hold*, an expression sometimes used for *depth of the hold*.

Heliacal. A star rises heliacally when it first becomes visible in the morning, after having been hidden in the sun's rays; and it sets heliacally when it is first lost in the evening twilight, owing to the sun's proximity.

Helier. A cavern into which the tide flows.

Heliocentric. Concentric with the sun. See GEOCENTRIC.

Heliometer. An instrument designed for the accurate measurement of the diameters of the sun or planets.

Heliostat, or Heliotrope. This instrument reflects the sun's rays by a silvered disk, and is used in the great trigonometrical surveys. It has been visible at 100 miles distance.

Hell-afloat. A ship in which the lives of the officers and crew are rendered unhappy by the tyranny of the commanding officer.

Helm. The apparatus by which a vessel is steered. In small craft it consists of the rudder and tiller; in large vessels a wheel is added to give additional power. The helm is *amidships* when the rudder, tiller, and keel are in the same plane. It is *a-port* (or *a-starboard*) when the tiller is borne over to the port (or starboard) side. It is *a-lee* (or *a-weather*) when the tiller is borne over to the lee (or weather) side; it is also *down* (or *up*) when the tiller is borne over to the lee (or weather) side. It is *hard* a-port, a-lee, etc., when the tiller is borne over to the extreme limit. In case the tiller projects abaft, instead of forward of the rudder, the positions of the tiller will, of course, be the reverse of those given above. *To right* the helm, to put it amidships. *To shift* the helm, to bear the tiller over to the corresponding position on the opposite side of the ship. *To ease* the helm, to let the tiller come more amidships to lessen the strain on the rudder or tiller-ropes. *Steady!* the order to the helmsman to steer as the ship heads when the order is given. *Steady a-starboard* (or *a-port*)*!* the order to steer slightly to the left (or right). *Meet her*, turn the wheel in the opposite way to that in which the ship's head is moving, in order to check her at the proper point. *Nothing to starboard, windward, westward*, etc., a caution to the helmsman that the ship must not be allowed to go the slightest to starboard, windward, westward, etc., of her course. *No higher* (or *nothing off*), a caution to the helmsman, when sailing close-hauled, that the ship is too near (or not near enough) the wind; whereupon the wheel is put a little up (or down). When the ship is a good full and by, the fact is announced by saying *very well thus* or *very well dice*. *Luff*, to put the helm down and bring the ship's head up to the wind. *Mind your weather helm*, a caution to the helmsman to meet her if she begins to fly to,—generally given when about to relieve the ship of head-sail, or when some of the gear of the head-sails has been carried away. The terms *helm* and *wheel* are used indiscriminately. *To helm*, an old word for *to steer*. See RUDDER.

HELM-PORT. The hole in the counter through which the head of the rudder passes.

HELM-PORT TRANSOM. A timber across the counter at the height of the helm-port and bolted through every timber.

HELMSMAN. The person who has the management of the helm for the time being. When there are two or more men at the helm the man at the weather side of the wheel is the responsible helmsman, the others being placed at the wheel to assist in the manual labor or for instruction. The best seamen in the ship are sent to the weather-wheel, relieving each other every two hours; each period of two hours is called a *trick*. The lee wheel is taken by the ordinary seamen and landsmen.

Helsingfors, a seaport town on the Gulf of Finland, Russia, in lat. 60° 11′ N.; lon. 24° 75′ E. Pop. 33,700. Its harbor is defended by the strong citadel of Sveaborg. It has an active trade in exporting grain and importing manufactured goods.

Hemp (*Cannabis sativa*). A manufactural plant of equal antiquity with flax. The produce of hemp in fibre varies from 3 to 6 hundredweight per acre, and forms the best of all cordage and ropes. It is mixed with opium in the preparation of those rich drugs called hasheesh.

Hen-frigate. A ship wherein the captain's wife interferes in the duty or regulations.

Henry, The Navigator. A famous prince, fourth son of John I., King of Portugal, born at Oporto in 1394. He first won distinction at the conquest of Ceuta, in 1415. His grand ambition was to discover unknown regions. Having, after the death of his father, taken up his residence at Sagres, in Algarve, he erected there an observatory and established a school for the instruction of the sons of the nobility in navigation and its kindred sciences. He dispatched his pupils on voyages of discovery, one of which resulted in the discovery of the Madeira Islands, in 1418. In 1433 one of his mariners rounded Cape Nun, up to that time regarded as the end of the earth, and took possession of the coasts as far south as Cape Bojador. The following year one of his ships reached a point 120 miles beyond Cape Bojador, and in 1440 Cape Blanco was attained. Henry had alone borne all the expenses of these voyages, but from this time forth societies formed under his patronage and guidance assumed the cost of prosecuting the work of discovery, which had become a passion with the whole nation. His own interest and energy, however, continued unabated. In 1446 his captain, Nuno Tristan, doubled Cape Verd, in Senegambia, and in 1448, Gonzalez Vallo discovered three of the Azores. Henry died in 1463, having had the satisfaction of learning that his mariners had reached as far south as Sierra Leone.

Hen's-ware. A name of the edible sea-weed *Fucus esculentus.*

Hercules. A constellation to the south of Lyra and Draco. *α Herculis* (called also *Ras Algethi*) and *α Ophinci* form a pair, which may be known by their being the first bright stars in a line drawn southward from the pair in Draco, *α Herculis* being nearest to the Great Bear. According to the calculations of Sir W. Herschel, the solar system is traveling towards the star λ *Herculis*, R. A. 17^h 25.9^m, Dec. 26° 12′ N.

Hercules, Pillars of. The name given by the ancients to the two rocks at each side of the entrance to the Mediterranean. The first author to mention them was Pindar, who places one of them at Gades (Cadiz); the most general opinion, however, identified them with Calpe (now Gibraltar) and Abyla (now Ceuta).

Herling. A congener of the salmon species found in Scotland; it is small and shaped like a sea-trout.

Hermit-crab. A name applied to a group of crabs (family *Paguridæ*) of which the hinder part of the body is soft, and which habitually lodge themselves in the empty shell of some mollusk. Also called *soldier-crab.*

Hermo. A Mediterranean term for the meteor called *carpo-santo.*

Herndon, William Lewis. Born in Fredericksburg, Va., October 25, 1813; drowned by the sinking of steamer "Central America," September 12, 1857. He entered the navy at the age of 15; served in the Mexican war; and was 3 years engaged with his brother-in-law, Lieut. Maury, in the Observatory at Washington. In 1851–52 he explored the Amazon River, under the direction of the U. S. government. A narrative of the expedition is contained in Herndon's "Exploration of the Valley of the River Amazon" (1853), and in Part II. of the same work, by Lieut. Gibbon, who accompanied him during a part of the journey, 1854. In 1857 he was commander of the steamer "Central America," which left Havana for New York, September 8. September 11, during a violent gale, she sprang a leak, and sank on the evening of September 12, near the outer edge of the Gulf Stream, in lat. 31° 44′ N.

Herne. A bight or corner, as Herne Bay, so called from lying in an angle.

Hernshaw, Herne. Old words for the heron.

Heron. A large bird of the genus *Ardea*, which feeds on fish.

Herring. A fish of the genus *Clupea* (*C. harengus*). Herrings move in vast shoals, coming from high northern latitudes in the spring to the shores of Europe and America, where they are taken and salted in great quantities. *King of the herrings*, a cartilaginous fish (*Chimacar monstrosa*), allied to the sturgeon, which follows the shoals of herring. The males of the species have a spinous disk in front of the eyes; whence the name.

HERRING-BONING. A method of sewing up rents in a sail by small cross stitches, by which the seam is kept flat.

HERRING-BUSS. A peculiar boat of 10 or 15 tons, for the herring-fishery.

HERRING-COB. A young herring.

HERRING-GUTTED. See SHOTTEN-HERRING.

HERRING-HOG. A name for the porpoise.

HERRING-POND. The Atlantic Ocean.

Heterodromous Levers. The windlass, capstan, crank, crane, etc.

Heteroplon. A kind of naval insurance, where the insurer only runs the risk of the outward voyage; when both the going out and return of a vessel is insured, it is called *amphoteroplon.*

Hettle. A rocky fishing-ground in the Firth of Forth, which gives name to the fish called Hettle-codling.

Hidden Harbor. That of which the outer points so overlap as to cause the coast to appear to be continuous.

Hide. To beat; to rope's-end or drub.

High-and-dry. The situation of a ship or other vessel which is aground, so as to be seen dry upon the strand when the tide ebbs from her.

High Latitudes. Those regions far removed from the equator towards the poles of the earth.

High-pressure Engine. A non-condensing steam-engine, or one in which the steam, after having performed its work, is expelled into the atmosphere instead of into the vacuum of a condenser.

High-water. The greatest height of the flood-tide. See TIDE.

HIGH-WATER MARK. The line made by the water upon the shore when at its greatest height; it is also designated the *flood-mark* and *spring-tide mark.* This constitutes the boundary-line of admiralty jurisdiction as to the soil.

Higre. See BORE.

Hike. A brief equivalent to "*be off*," "*go away.*" It is generally used in a contemptuous sense; as, he was *hiked off*,—that is, dismissed at once, or in a hurry. *To hike up*, to kidnap, to carry off by force.

Hilt. The handle and guard of a sword.

Hind-castle. A word formerly used for the poop, as being opposed to *fore-castle.*

Hippagines, or Hippagogæ. Ancient transports for carrying cavalry.

Hipper, or Hipping-stones. Large stones placed for crossing a brook.

Hippo-camp. The sea-horse.

Hippocampus. A small fish, so termed from the head resembling that of a horse. They live among reeds and long fuci, to which they cling with prehensile tails.

Hippodame. An old word for a sea-horse.

Hipsy. A drink compounded of wine, water, and brandy.

Hirecano. An old word for hurricane.

Hirst. The roughest part of a river-ford. A bank.

Hitch. A species of knot by which a rope is made fast to a spar or other object. Figuratively, an impediment. *To hitch*, to make a rope fast by means of a hitch. To pull up with a jerking motion; as, to *hitch up* the trousers. For the various hitches, see under proper heads.

Hitchcock, Robert B., Commodore U.S.N. Born in Connecticut. Appointed from Connecticut, January 1, 1825; schooner "Shark," West India Squadron, 1827; frigate "Delaware," Mediterranean Squadron, 1829–31; special duty, 1833–34.

Commissioned as lieutenant, March 3, 1835; special duty, 1837; frigate "Ohio," Mediterranean Squadron, 1840; rendezvous, Boston, 1843; frigate "Savannah," Pacific Squadron, 1845–46;

ordnance duty, 1850–52; commanding store-ship "Relief," 1853; inspector, etc., Boston, 1854–55.

Commissioned as commander, September 14, 1855; ordnance duty, 1856–57; commanding steam-frigate "Merrimac," Pacific Squadron, 1858–60; inspector of ordnance, 1861.

Commissioned as captain, 1861.

Commissioned as commodore, July 16, 1862; commanding steam-sloop "Susquehanna," Western Gulf Squadron, 1862–63. During the greater portion of the time Commodore Hitchcock was attached to the Western Gulf Squadron, and for some months he was the senior officer of the blockading fleet off Mobile. Ordnance duty, 1864–65; commandant navy-yard, Norfolk, 1866; special duty, 1870–72. Retired, September 25, 1866.

Hitcher. An old term for a boat-hook.

Hoam. The dried fat of the cod-fish.

Hobble. A perplexity or difficulty. *Hobbles*, irons or fetters.

Hobbler (*Eng.*). A coast-man of Kent, a bit of a smuggler, and an unlicensed pilot, ever ready for a job in either of these occupations. Also, a man on land employed in towing a vessel by a rope. Also, a sentinel who kept watch at a beacon.

Hobit. A small mortar of 6 or 8 inches bore, mounted on a gun-carriage, in use before the howitzer.

Hoboken, Hudson Co., N. J., is a port of entry opposite New York City, and immediately above Jersey City. The Stevens Institute of Technology is located here, and the city has extensive manufactories and foundries. It is one of the largest coal-shipping ports in the world, being the principal depot from which New York and its shipping are supplied. Three lines of steamers start from this port. Intercourse with New York is maintained by three lines of ferry-boats. Pop. 25,000.

Hobrin. A designation of the blue shark, *Squalus glaucus.*

Hoc. The picked dog-fish, *Squalus acanthias.*

Hock-saw. A fermented drink along the coasts of China, partaking more of the nature of beer than of spirit.

Hod. A hole under a bank or rock forming a retreat for fish.

Hoddy-doddy. A sea-term for a revolving light.

Hodmadods. The name among early navigators for Hottentots. See Dodman.

Hoe-mother, or Homer. The basking shark, *Squalus maximus.*

Hoe-tusk. The smooth hound-fish of the Shetlanders, *Squalus mustela.*

Hog. A kind of rough, flat scrubbing broom, serving to scrape a ship's bottom under water, formed by inclosing a number of short twigs of birch, or the like, between two pieces of plank, which are firmly attached to each other; the ends of the twigs were then cut off even, so as to form a brush of considerable extent. To this was fitted a long staff, together with two ropes, the former of which was used to thrust the hog under the ship's bottom, and the latter to guide and pull it up again close to the planks, so as to rub off all the dirt. This work was usually performed in the ship's boat.

Hogged. A significant word derived from the animal; it implies that the two ends of a ship droop lower than the midship part, consequently that her keel and bottom are so strained as to curve upwards. The term is therefore in opposition to that of *sagging.* Many ships hog in launching, caused by the after part of the vessel not being properly water-borne till she is clear of the ways.

Hog-chains. Chains used for keeping a ship of light structure in shape, being attached to a frame called a hog-frame at one end, and secured at the other end to some part of the vessel which needs sustaining.

Hog-frame. A truss-frame which is used in light-draft steamers, especially to compensate for the want of strength in the sides of such steamers.

Hog-in-armor. A sobriquet for an ironclad ship.

Hogo. From the French *haut goût*, a disagreeable smell, but rather applied to ill-ventilated berths than to bilge-water.

Hoise. The old word for hoist.

Hoist. To raise by means of a rope or tackle. The perpendicular height of a flag or sail,—applied to sails, the yards of which travel up and down masts. The corresponding term for courses is *drop.* The hoist of a stay-sail is the length of the luff.

Hold. The interior portion of a ship below the lower deck. The *after-hold* is abaft the main-mast, the main-hold just forward of the main-mast, and the fore-hold is in the vicinity of the fore-hatchway. *To stow* the hold, to arrange the contents of the hold in a proper manner. *To break out* the hold, to remove all articles therefrom. *To hold* the land, to keep a ship near the land in cruising. A ship *holds* her own when she is not losing ground in a race or chase. *To hold a good wind*, to have weatherly qualities. *To hold water*, to check the progress of a boat by immersing the oars and keeping them stationary in the water.

Hold-beam. One of the lowest range of beams in a merchantman. In a man-of-war, they support the orlop-deck.

Hold-stanchions. The stanchions which support the hold-beams amidships.

Holding-down Bolts. The large bolts used for securing the machinery of a vessel to the hull. In wooden ships a number of these bolts pass entirely through the floor-timbers, and are provided with large square washers embedded in the outside of the frame. Such bolts, if of iron, are covered on parts passing through wood by a casing of bronze composition cast upon them to protect them from corrosion.

Holiday. Any part left neglected or uncovered in paying, painting, blacking, tarring, etc.

Holland, Navy of. The growth of European navies has been necessarily contemporaneous. The rivalries born of foreign possessions and commerce put England, Holland, and Portugal on the alert in the 16th century, and the acquisitions of each nation on the shores of India and the islands of the Eastern Archipelago brought them at an early period into hostile contact. France and Spain followed in their wake, and in less than a century all of these nations were alternately in arms against each other, or allied for offensive and defensive purposes. From her

maritime position Holland has been a nursery of seamen for centuries, and at one time she was omnipotent on the ocean. The history of her successes is told in the brief biographies of De Ruyter and Van Tromp (which see), and the record of the Dutch explorers of northern regions and the Pacific Ocean. It is unnecessary, therefore, to detail them minutely here. Let it suffice that, owning valuable lands in the Eastern Archipelago, and keeping a watchful eye upon the cupidity of her German neighbor, she now maintains a fleet of 25 armored and 90 unarmored steam-vessels, varying in indicated horse-power from 340 to 4630. The navy is officered by 2 vice- and 4 rear-admirals, 19 captains, 43 lieutenant-captains, 308 lieutenants (first and second), 52 midshipmen, and 65 medical officers. The marine infantry consists of 45 officers and 2120 non-commissioned officers and privates. The navy is recruited by enlistment, but conscription is resorted to in an emergency. The colonial possessions of Denmark in India comprise 16 islands and parts of the coasts of Borneo and Sumatra, and 6 West India Islands, besides Surinam.

Hollards. The dead branches and loppings of trees.

Hollebut. A spelling of *halibut.*

Hollow Sea. The undulation of the waves after a gale; long hollow-jawed sea; ground-swell.

Hollow Shot. Introduced principally for naval use before the horizontal firing of shells from guns became general. Their weight was about two-thirds that of the solid shot; thus they required less charge of powder and weight of gun than the latter, whilst their smashing effect and first ranges were supposed to be greater. It is clear, however, that if filled with powder, their destructive effect must be immensely increased.

Holometrum Geometricum. A nautical instrument of brass, one of which was supplied to Martin Frobisher in 1576.

Holus-bolus. Altogether; all at once.

Holy-stone. A sandstone used in scrubbing decks. The name probably arose from their being most frequently used on Sunday, though by some it is attributed to the kneeling of the men while using it. *To holy-stone*, to clean a deck with holy-stones. *To dry holy-stone*, to holy-stone without using water,—done on lower decks in damp weather.

Home. Domicile; residence. The place where a person or thing abides. *To haul home a sheet*, to haul it to its proper position when the sail is set. The anchor comes *home* when, in heaving up, the anchor is dragged toward the ship instead of the ship's being hauled up to the anchor.

Home-station. The station which includes our Atlantic coast within its limits; the North Atlantic Station.

Homeward-bound. Returning homeward.

Homeward-bounder. A very long pennant hoisted by a homeward-bound ship.

Homocercal. Having the tail symmetrical, the vertebral column terminating at its commencement; opposed to *heterocercal.*

Honolulu. Capital of Hawaii, on the southwest side of Oahu, one of the Sandwich Islands. Lat. 21° 18′ 12″ N.; lon. 157° 50′ 36″ W. It has a good harbor, and is the principal station for vessels cruising in the Pacific Ocean. Pop. 15,000.

Hood. The foremost and aftermost plank in each strake. A covering for a hatch or skylight. The cowl of a funnel. *Naval hoods*, thick pieces of timber encircling the hawse-holes.

Hooding Ends. The ends of the hoods where they set in the rabbet of the stem and the stern-post.

Hook. A name given to anything having the end bent or curved; as, boat-hooks, can-hooks, foot-hooks, etc.

Hook and Butt. The scarfing of two ends of plank over each other, in such a manner that they cannot be drawn apart endways.

Hook-motion. In the steam-engine, an arrangement of valve-gear in which the motion for going ahead or backing is transmitted from the respective eccentrics to a rock-shaft or valve-stem cross-head by *eccentric hooks* or *gabs.* This enables the valves, when the hooks are detached, to be worked with a starting-bar by hand, which is convenient in certain classes of single engines.

Hook-scarf. Differs from the plain scarf, in that the upper end is formed into a hook and projects from one to two or more inches into the timber, thus giving greater security.

Hooker, or Howker. A coast- or fishing-vessel,—a small hoy-built craft with one mast, intended for fishing. They are much used by pilots, especially off the Irish ports. Also, Jack's name for his vessel, the favorite "old hooker." Also, a term for a short pipe, probably derived from *hookah.*

Hoop. The principal hoops of different kinds used for nautical purposes are noticed under their several names. In wind-bound ships in former times the left hands of several boys were tied to a hoop, and their right armed with a nettle, they being naked down to the waist. On the boatswain giving one a cut with his cat, the boy struck the one before him, and each one did the same, beginning gently, but becoming irritated, they at last laid on in earnest. Also, an old nautical punishment for quarrelsome fighters was, that two offenders, similarly fastened, thrashed each other until one gave in. The craven was usually additionally punished by the commander.

Hopkins, Esek, Commodore U.S.N., was born in Scituate, R. I., in 1718. Was appointed brigadier-general of Rhode Island forces by its governor, and on December 22, 1775, was appointed commander-in-chief of the American navy, being the first who held that title. Was called commodore and admiral in correspondence. He went to sea in the first squadron of 8 vessels, hoisting his flag in the "Alfred." Captured New Providence in an expedition on the 19th February, and also took a brig and two tenders. Encountering a frigate at sea, he did not succeed in capturing her, and, for an alleged want of skill in engaging her, he was censured by Congress, although a defense of his conduct by John Adams partially cleared him, and led the president of Congress to compliment him. Not getting his ships ready for sea, he was again cited to appear to answer for it, but neglected to obey the summons promptly, and was dismissed by Congress January 2, 1777, having

been at the head of the service 1 year and 10 days.

After the war he resided near Providence, R. I., and was several times a member of the General Assembly for that State, and died there February 26, 1802, aged 84. He was, when made commander-in-chief, 57 years old, and, Bancroft says, was old and incompetent. His portraits show him to be a man of vigor, and he was influential in the political affairs of his own State. His bravery was never called into question, but he was doubtless not a good seaman and incompetent to command the navy.—*F. S. Bassett, Lieutenant U.S.N.*

Hopkins, W. E., Commodore U.S.N. Born in Virginia. Appointed from Virginia, November 13, 1839; Home Squadron, 1841–43; Naval School, Philadelphia, 1845; frigate "Cumberland," 1847; schooner "Falcon," Home Squadron, 1848–49; coast survey, 1850–51; sloop "Marion," coast of Africa, 1851–55.

Commissioned as lieutenant, July 10, 1854; receiving-ship, Philadelphia, 1856–58; sloop "Macedonian," Mediterranean Squadron, 1859–60; sloop "Preble," 1861.

Commissioned as lieutenant-commander, July 16, 1862; rendezvous, Philadelphia, 1862; commanding steamer "Saginaw," Pacific Squadron, 1863–65.

Commissioned as commander, November 4, 1863; commanding steamer "Shamrock," European Squadron, 1866–67; League Island, Pennsylvania, 1868.

Commissioned as captain, June, 1870; navy-yard, Mare Island, California, 1870–72; commanding "Benicia," North Pacific Station, 1872–75; commanding receiving-ship "Independence," Mare Island, 1877–78.

Commissioned as commodore, December 1, 1877; leave of absence, 1879–80.

Hopper-punt. A flat-floored lighter for carrying soil or mud, with a *hopper* or receptacle in its centre to contain the lading.

Hoppo. The chief of the customs in China.

Hoppo-men. Chinese custom-house officers.

Horie-goose. A name for the *Anser bernicla*, or brent-goose.

Horiolæ. Small fishing-boats of the ancients.

Horizon (Gr. *horizon*, the boundary-line). The circle in which the heavens and the earth appear to meet. The horizon is the primitive circle in one of the systems of co-ordinates for defining points of the celestial concave relatively to the position of an observer on the earth's surface. See Co-ordinates for the Celestial Sphere.

Horizon, Artificial. A reflector whose surface is perfectly horizontal, used to observe altitudes on shore. See Artificial Horizon.

Horizon, Celestial. The great circle in which the planes of the sensible and rational horizon (becoming coincident when produced indefinitely) cut the celestial sphere.

Horizon-glass. In reflecting astronomical instruments, such as the sextant, the horizon-glass is that which is fixed in front of the telescope, the lower portion of it being a mirror, the upper transparent. It derives its name from the fact that in taking an altitude the horizon is seen by direct vision through its upper portion.

Horizon, Rational. The plane through the centre of the earth drawn parallel to the tangent-plane at the observer's station.

Horizon, Sea. The small circle which bounds the view of a spectator in the open sea.

Horizon, Sensible. The plane touching the earth at the station of the observer, and extended to the celestial sphere.

Horizon, Shore. When the sea-horizon is hidden from view by intervening land, the water-line on the beach often serves the purpose of a horizon in observing altitudes. See Dip.

Horizontal Parallax. The parallax of a celestial body when in the horizon of the observer; distinguished from *parallax in altitude*. See Parallax.

Horizontal Plan. Any level plane or plan to show the length and breadth of the object to be delineated without showing the height.

Horizontal Projection of the Sphere. A projection of the sphere—whether orthographic, stereographic, or central—in which the primitive plane or plane of projection coincides with, or is parallel to, the horizon.

Horizontal Ribband-lines. Those ribband-lines used in laying off the ship upon the mold-loft floor, which are taken off level with the ship's body, or square from the centre line at the intersection of the frame-lines, instead of in the diagonal direction, before being applied to the half-breadth plan, where they are used for fairing the ship's body.

Horizon, Visible. The boundary of our view, whether of the heavens or of the earth.

Horn. One of the arms of the cross-trees, or of a cleat. To place anything to stand square from the middle line of the ship, by setting off an equal distance from each side of the middle line, as in a frame.

Horn-beak. A fish. See Horn-fish.

Horned Pout. A fish of the genus *Pimebodus;* cat-fish. See Cat-fish.

Horn-fisc. Anglo-Saxon for the sword-fish.

Horn-fish. The gar-fish, or sea-needle, also called *horn-beak.*

Horn-fisted. Having hands inured to hauling ropes.

Horn-keck. An old term for the *green-back* fish.

Hornotinæ. Ancient vessels which were built in a year.

Horologium. See Constellation.

Horologium Universale. An old brass nautical instrument, one of which was supplied to Martin Frobisher when fitting out on his first voyage, in 1576, for the discovery of a northwest passage.

Horse. The iron rod placed between the fife-rail stanchions on which the leading-blocks are rove or secured. Also in fore-and-aft rigged vessels it is a stout bar of iron with a large ring or thimble on it, which spans the vessel from side to side just before the foremast, for the fore-stay-sail sheet, and when required one is also used for the fore and main boom sheets to haul down to and traverse on. A block in a whaler for cutting blubber on. An old name for a foot-rope, and it was also formerly applied to what is now known as a *lizard.* The name is also sometimes given to a jack-stay forward or abaft the mast, on which a yard or sail is hoisted. *Salt-horse*, Jack's name for salt-beef.

Horse-block. A grating-platform for the convenience of the officer in charge of the deck.

Horse-buckets. Covered buckets for carrying spirits or water in.

Horse-buckie. The great whelk.

Horse-cockle. See GAWKY.

Horse-foot. A name of the *Limulus polyphemus;* called also the horse-shoe or lantern-crab.

Horse-latitudes. A space between the westerly winds of higher latitudes and the trade-winds, notorious for tedious calms. The name arose from old navigators often throwing the horses overboard which they were transporting to America and the West Indies.

Horse-mackerel. A large and coarse member of the Scomber family, remarkably greedy, and therefore easily taken, but unwholesome.

Horse-marine. An awkward lubberly person. One out of place.

Horse-potatoes. The old word for yams.

Horse-power. The unit of measure of the power of prime movers, represented by 33,000 *foot-pounds per minute.* See POWER.

In the steam-engine, indicated horse-power, the symbol for which is IHP, is computed by multiplying the mean unbalanced pressure on the piston in pounds, as obtained by an indicator, by the velocity of the piston in feet per minute, and dividing the product by 33,000. This includes the energy absorbed by friction of the loaded machinery, power required for working pumps, etc.; but these resistances to useful work bear nearly a constant ratio to the power employed in well-constructed machinery of similar type. *Gross horse-power* includes all prejudicial resistances, such as friction, back-pressure, etc.; and *net horse-power* is the actually applied energy to the work performed; and *nominal horse-power* is a British conventional term expressive of the capacity of the cylinder and size of the engine, in which it is assumed that a constant effective steam-pressure of 7 pounds per square inch and a piston velocity of about 200 feet per minute corresponds to an indicated horse-power.

Horse-shoe Clamp. The iron or copper straps so shaped, used as the fastenings which connect the gripe with the fore-foot at the scarf of the keel and stem.

Horse-shoes. Straps of composition in the form of a horse-shoe, used for securing the stem to the keel, placed on opposite sides, let in flush and bolted through; rings are now generally used instead.

Horse-tongue. A name applied to a kind of sole.

Horsing-iron. An iron fixed in a withy handle, sometimes only lashed to a stick or tree-nail, and used with a beetle by calkers. *To horse-up,* to harden in the oakum of a vessel's seams with a horsing-iron.

Hose. A long flexible pipe, made of leather, canvas, or gum and canvas, used for conveying water for extinguishing fires or for other purposes.

HOSE-COUPLING. An arrangement for connecting sections of hose together. It consists of a pair of cylindrical pieces of metal, usually brass, provided with a male and female screw so that they can be firmly connected together and made water-tight by means of a gum or leather washer. The parts are secured to the ends of the sections of hose by clamps or by being bound with wire.

Hose-fish. A name for a kind of cuttle-fish.

Hospital. A place appointed for the reception of sick and wounded men, with a regular medical establishment. An attacking force should avoid firing on hospitals whenever they are designated by flags or other symbols understood. It is an act of bad faith, amounting to infamy, to hoist the hospital protective flag over any other building, unless the attacking force should request or consent that it might be used in order to spare edifices dedicated to science, or literature, or containing works of art. See NAVAL HOSPITALS.

Hospital Gangrene. *Synonyms.*—Known under the various titles of putrid ulcer, pulpy gangrene, pourriture d'hôpital, gangræna contagiosa, phagedæna gangrænosa, gangræna nosocomialis, hospital mortification, diphtheria of wounds, etc.

History.—The history of this disease may be traced backwards, for a period of more than 150 years, in the records of great wars and of large hospitals.

La Motte, in 1722, mentioned, and Pouteau, in 1783, described, hospital gangrene. Hennen, Blackadder, and Guthrie wrote excellent accounts of its appearance during the Peninsular war of 1813. The Crimean war, the war of the Rebellion in 1861, and the Franco-Prussian war, all added largely to the records of this now well-recognized disease.

Nature and Cause.—Its essential nature has, however, not been understood. Unsuccessful attempts to explain its appearance and spread by reference to bad sanitary surroundings have been made. But it has been found to occur under the best hospital conditions, and has failed to appear where filth, overcrowding, and neglect would seem to have specially invited it.

Without stating various conflicting views, it is sufficient to give what is to the writer a simple and complete solution of the question of the origin and epidemic spread of hospital gangrene, viz., that it is identical with diphtheria.

The facts going to show this are as follows:

1st. *Historical proofs,* as of the co-existence of both these diseases in epidemic form at the same time and place.

This occurred under the writer's observation in Cincinnati, O., during the civil war. Hospital gangrene attacked the U. S. army hospitals, while diphtheria was rife in civil practice throughout the city.

Similar observations were made in Philadelphia, Pa., and Nashville, Tenn., and other cities during the war.

2d. *Similar causation.* An atmospheric miasm or germ, epidemic under favorable circumstances, necessarily exists to account for the origin and spread of diphtheria.

Von Pitha and Fock declare the same conclusion as the result of their studies into the cause of hospital gangrene.

3d. *Interchangeable results* from the same poison have been observed by the writer. Several cases of hospital gangrene have occurred in his practice, caused by direct infection of wounds by diphtheria; and one case of hospital gangrene communicated diphtheria to two other members of a family.

4th. *Contagion* by contact and *infection* through the atmosphere are known to be modes of spreading both these diseases.

5th. *Pathological proofs.* The microscopic appearances in hospital gangrene are bacteriæ, micrococci, and streptococci, exactly as in diptheria. Both diseases, also, may be separated into two forms, one being catarrhal, exudative, or pulpy, the other ulcerative, phagedenic, malignant, and rapidly fatal.

6th. *Both diseases are local* at first, general infection of the constitution only occurring secondarily in either disease.

7th. *Methods of cure* are similar, and identical remedies are employed in both diseases.

8th. *Similar modes of death* are noticed, and especially is "heart-clot" frequent in both diseases.

Hospital gangrene, therefore, is diphtheria attacking wounded surfaces.

Symptoms.—Such attack is ushered in by stinging pain in the part. The process of healing in the wound is arrested.

Ash-colored and yellowish exudations are seen to spread over its surface. Loss of vitality, sloughing, and destructive changes follow. Erysipelas may complicate. Hemorrhages are apt to set in, often fatally. Vast destruction of the soft tissues occurs in phagedenic cases. In 24 hours a wound may become enlarged from the size of a silver dollar to an extent sufficient to embrace the entire limb. In many there is very little or no fever or constitutional disorder. In others, irritative or adynamic forms of fever may be caused by absorption of putrescent material from the wound. But no constitutional disorder inaugurates the attack, and no increased liability is incurred by the scrofulous, syphilitic, or scorbutic men in hospitals.

Treatment.—Isolation in tents, in the open air, is of the first importance, both as a curative and as a preventive means.

Next, the local disease must be destroyed in its nest. Entire removal by knife, scissors, and cauterization of all diseased tissue must be effected.

Disinfection of the wound by the most efficient germicide agents must be thoroughly accomplished.

Finally, suitable protective and antiseptic dressings must be applied to guard the purified surfaces from re-inoculation by the atmospheric germs of the disease.

These principles embrace all that is needed for the local cure.

Either separately or variously combined, they have entered into all the successful plans of treatment on record.

Nitric acid, bromine, and the actual cautery have been found the most efficient agents to destroy the local disease, both from their caustic and their chemical action.

Chlorine was used with complete success by the writer in the Cincinnati U. S. army general hospitals.

These agents also accomplish the purpose of disinfection in great measure.

Dressings of creasote, carbolic acid, charcoal, buttermilk, turpentine, and the hydrocarbons, all have been successfully employed, and act by protecting the wound from renewed atmospheric infection, as well as by promoting the healing process.

In general, supporting treatment by food stimulants, iron, quinine, etc., is strongly indicated.

Results.—The fatality of hospital gangrene was enormous in the earlier wars, amounting in the hospitals of the Peninsular campaign to one-third of all those attacked. But during the late war the skill and originality of American surgeons very greatly lessened the mortality.

Goldsmith	records	152	cases and	4	deaths.
North	"	60	"	3	"
Brinton	"	88	"	2	"
Weeks	"	115	"	6	"
Herr	"	202	"	14	"

Over 100 cases were treated at Cincinnati, O., hospitals with but two deaths.

These results are unprecedented, and are due to early local treatment by strict disinfectant and antiseptic means.

The malignant form of the disease, however, is often beyond remedy, even under modern methods of care. Death follows close upon the attack, with symptoms of profound shock and blood-poisoning.—*John T. Carpenter, President of the Pennsylvania State Medical Society, and late Medical Director U. S. Vols.*

Hospital-ship. A vessel fitted to receive the sick, either remaining in port, or accompanying a fleet, as circumstances demand.

Hostage. A person given up to an enemy as a pledge or security for the performance of the articles of a treaty.

Hot-air Engine. An engine driven by the expansive force of heated air, a quantity of which, at normal temperature, is compressed by a suitable apparatus; heated to a high temperature; then allowed to expand and drive a piston until the energy due to its contained heat is nearly expended; and finally expelled from the cylinder.

Hot-coppers. See Coppers.

Hot-shot. Balls made red-hot in a furnace. Among the savages in Bergon, the women are in the rear of the combatants, and they heat the heads of the spears, exchanging them for such as are cooled in the fight.

Hot-water Pipe. A pipe for conveying water of condensation, etc., from a condenser to a feed-water reservoir or hot-well.

A pipe connected with a steam-boiler of a vessel of war, for the purpose of throwing hot water upon an enemy.

A pipe for warming an apartment by means of hot water.

Hot-water Pump. A pump attached to some types of steam-engine condenser for the purpose of withdrawing the water of condensation and discharging into a feed-water reservoir.

A pump specially adapted to the transmission of hot water by having its valves and packing made of material that can withstand the temperature. Leather, for instance, will not serve for valves and packing, even at a temperature far below that of boiling water. Such a pump cannot be depended upon to *draw* water, but must be supplied from a head; and ample *pet-cocks* must be provided to permit any accumulated vapor to escape from the barrel- and valve-chambers.

Hot-well. A reservoir into which is discharged the water of condensation drawn from the condenser of a steam-engine by an air-pump or hot-water pump.

Hound-fish. The old Anglo-Saxon term for dog-fish (*hund-fisc*).

Hounding. The length of the mast from the heel to the lower part of the head.

Hounds. Those projections at the mast-head serving as supports for the tressle-trees of large and rigging of smaller masts to rest upon.

Houndsid. A rope bound round with service.

Hour-angle. Generally, an angle at the poles of the heavens included between different hour-circles.

HOUR-ANGLE OF A HEAVENLY BODY. The angle at the elevated pole included between the celestial meridian of the observer and the hour-circle passing through the body. It is reckoned positively from the upper culmination of the body westward from 0 to 360°. The hour-angle is sometimes reckoned from the meridian in both directions,—positively to the westward, and negatively to the eastward; it would be well, however, if it were always reckoned in conformity with the apparent diurnal motion, just as right ascension is reckoned in conformity with the direct movements of the heavenly bodies.

Hour-circle. A great circle of the celestial sphere passing through the poles of the equinoctial; so called because it marks out all places having the same hour-angle.

House. To cover from the inclemencies of the weather; as, to house a ship over in harbor during cold weather. *To house a mast*, to lower it partly, to lessen the effect of a gale on the masts and rigging. *To house the bowsprit*, to ship it in its proper place. *To house a gun*, to run it in clear of its port and secure it. *To house an awning*, see AWNING.

HOUSE-BOAT. A boat with a cabin.

HOUSING. That part of a mast below the spar-deck. The inboard part of a bowsprit.

HOUSING-BOLT. A bolt above a port, over which the grommet is placed in housing a gun.

HOUSING-LINE. A line near the deck, to which the edge of an awning is secured when housed.

Houseline. Seizing-stuff made of three fine yarns laid up left-handed.

Houvari. A strong land-wind of the West Indies, accompanied by rain, thunder, and lightning.

Hovellers (*Eng.*). A Cinque-Port term for pilots and their boatmen; but colloquially, it is also applied to sturdy vagrants who infest the sea-coast in bad weather, in expectation of wreck and plunder.

Hover. To hang about; to move to and fro in the vicinity of; as, a vessel hovers about a coast.

Howard of Effingham, Lord. After many years of service in the reigns of Queen Mary and Elizabeth, this gallant seaman rose to the rank of lord high admiral, and in that capacity was mainly instrumental in preventing the dangers threatened by the Spanish Armada. At a later period (1596) he captured Cadiz in conjunction with the Earl of Essex.

Howe, Richard, Earl. The chronic state of war in which England found herself with France during the chief part of the 18th century afforded naval officers a large field of experience. Howe was constantly engaged in all parts of the world, and in each grade, from midshipman to admiral of the white, evinced great professional ability. Lord Hawke said of him that he never needed hints as to the *modus operandi* of enterprises. Hawke had only to direct that certain things were to be done, and Howe at once performed them. His chief service was in America when D'Estaing went to aid the revolted colonists, but he likewise did good work in the Mediterranean by supplying Gibraltar with provisions during the siege, and capped the climax of a brilliant career by a great victory over the French in the British Channel. The "glorious first of June" is a landmark in British history.

Howell, John C., Rear-Admiral U.S.N. Born in Pennsylvania, November 24, 1819. Appointed from Pennsylvania, June 9, 1836; sloop "Levant," West India Squadron, 1837–41.

Promoted to passed midshipman, July 1, 1842; frigate "Congress," Mediterranean Squadron, 1842–44; brig "Perry," East India Squadron, 1844–45; naval storekeeper, Macao, 1846–48.

Commissioned as lieutenant, August 2, 1849; frigate "Raritan," Home Squadron, 1849–50; sloop "Saratoga," East India Squadron, 1851–53; receiving-ship, Philadelphia, 1854–56; steam-frigate "Susquehanna," Mediterranean Squadron, 1856–58; receiving-ship, Philadelphia, 1859–60; steam-frigate "Minnesota," North Atlantic Blockading Squadron, 1861; battle of Hatteras Inlet.

Commissioned as commander, July 16, 1862; commanding steamer "Tahamo," Eastern Gulf Blockading Squadron, 1862–63; commanding steamer "Nereus," North Atlantic Blockading Squadron, 1864–65; two actions at Fort Fisher, December, 1864, and January, 1865.

Commissioned as captain, July 25, 1866; commanding rendezvous, Philadelphia, 1866–68; fleet-captain, European Squadron, 1869–70; chief of staff, European Fleet, 1871; commanding League Island Station, 1871–72.

Commissioned as commodore, January 29, 1872; commanding navy-yard, Portsmouth, N. H., 1872–75; chief of Bureau of Yards and Docks, 1875–78.

Commissioned as rear-admiral, 1877; special duty, 1878–79; commanding European Squadron, 1879–80.

Howitzer (derived by Grimm and Littré from the Bohemian *haufnice*, "catapult"). A short, light cannon, intended to throw large projectiles with comparatively small charges. A howitzer is of larger calibre than a gun of like weight; is mounted in a similar manner, and is used for shorter ranges. It was introduced by the Dutch in 1606, and soon became of general use, except by the French, who, considering it of small value because of the short range and inaccurate fire, did not introduce it until after Napoleon's wars had shown him its value. The howitzer was made with a chamber for the powder (of smaller diameter than the bore), and with a length of bore regulated to admit of the shell being reached by the hand, to adjust the fuze in the axis of the bore, after the gun was loaded. After the adoption of *sabots* this could be secured in long guns, and the howitzers were then made of greater length and came into universal use.

In the navy the howitzers are principally used in boats and in operations on shore; they would also be serviceable in repelling boarders. They

are of small calibre, the 24-pounder smooth-bore being the largest. The smooth-bores are being superseded by breech-loading rifled howitzers.

In the army howitzers of 8 inches bore are used for seige purposes, and for the defense of ditches in fortifications.

Hoy. A small vessel usually rigged as a sloop and employed in carrying freight and passengers along the sea-coast. It acquired its name from its stopping when called to from the shore, to take up goods or passengers. Hoys are now used for heavy work about a harbor; as transporting provisions, weighing anchors, etc.

Hoyman. One who navigates a hoy.

Hoyse. An old word for *hoist.*

Huddock. The cabin of a coal-barge.

Huddum. An old term for a kind of whale.

Hudson, Henry. A company of London merchants, desirous of shortening the route to China and Hindostan, fitted out an expedition, which they placed under the command of this English seaman in 1607. He sailed along the coast of Greenland beyond the 80th degree of latitude, when he was stopped by the ice. He had got within eight degrees of the pole,—a point never before attained by any navigator. He then returned home, but was soon employed by the Dutch East India Company to find a passage by the northeast. Failing in this, through the frozen condition of the seas, he sailed down the south coast of America, sighted Cape Cod, discovered Delaware Bay, and entered the great inland waters on which the city of New York stands. He went up one river as far as the site of Albany, and that river now bears his name. In 1610, Hudson was again engaged by an English company to attempt to find an entrance to the Pacific in a northwest direction. He passed through a strait and bay opening westward from the Greenland Sea, and these now bear his name. But his further explorations were stopped by the mutiny of his crew, who sent him adrift in a small shallop with scarcely any food. Neither Hudson, his son, nor the few men who adhered to him, were ever heard of again.

Huer. A man posted on an elevation near the sea, who by concerted signals directs the fishermen when a shoal of fish is in sight. Also the hot fountains in the sea near Iceland.

Hug. *To hug the land*, to sail as near it as possible. *To hug the wind*, to keep the ship as close to the wind as possible.

Hugger-mugger. Anything out of order or done in a slovenly way.

Hughes, Aaron K., Commodore U.S.N. Born in New York. Appointed from New York, 1838; made first cruise in the Pacific Ocean on board the frigate "Constitution," from January, 1839, until November, 1841; in February, 1842, was ordered to the brig "Boxer"; served in her in the Gulf of Mexico and in the West Indies until the autumn of the same year; served in the receiving-ship "Pennsylvania," Norfolk, Va., from January, 1843, until June of the same year; was then ordered to the frigate "Macedonian," African Squadron, and served in her until the winter of 1844.

Promoted to passed midshipman, May 28, 1844; served in the frigate "Columbia," coast of Brazil, from the fall of 1845 until the spring of 1846; served during the summer of 1846 in the office of the United States Coast Survey; in the fall of same year was ordered as passed midshipman to the steamer "Michigan," on the western lakes, and served in her until the summer of 1848; served in the receiving-ship "North Carolina" as passed midshipman from fall of 1849 until summer of 1850; was then ordered to the sloop "Albany," and served in her as acting master in the West Indies and Gulf of Mexico for two years and one month; in the winter of 1852 was ordered as acting master to the receiving-ship "Ontario," where he received a warrant as master in the line of promotion, and served in her until the summer of 1853.

Promoted to lieutenant, August, 1853, and in December of same year was ordered as lieutenant in sloop-of-war "Decatur," Pacific Squadron, until August of 1856; while attached to this vessel in Puget Sound, Washington Territory, in winter of 1855–56, had an engagement on shore, at the town of Seattle, with five hundred hostile Indians, who had attempted to murder the inhabitants, pillage and destroy the place; but through the unremitting watchfulness of the late Com. Guert Gansevoort their objects were frustrated by the landing of the officers and crew of the "Decatur"; engagement commenced at 8 A.M., and ended at 4 P.M., on the 26th day of January, 1856. It was estimated that the Indians lost 35 killed and 30 wounded. This ended hostilities in the territory. In the winter of 1856–57, ordered as lieutenant, and served on board the receiving-ship "Alleghany," Baltimore, as executive-officer until the fall of 1857, when he was ordered as lieutenant and executive-officer to the store-ship "Supply," of the African and Brazil Squadrons, serving until the fall of 1858; after a month's leave, was again ordered to the receiving-ship "Alleghany," where he served as a lieutenant until June, 1859; was then ordered as a lieutenant to the "San Jacinto," and served in her as second lieutenant, executive-officer, and about six weeks in command of that vessel, until January, 1860; was then ordered by the flag-officer commanding the African Squadron to the sloop "Portsmouth" as executive-officer, and served in her until June of same year; was then re-ordered to the "San Jacinto," at the Island of Madeira, and on her way to St. Paul de Loanda, west coast of Africa, was sent as prize-master of the captured slaver "Storm King," and after taking charge of that vessel 200 miles to the westward of the Congo River, and conveying 619 recaptured Africans to Monrovia, Liberia, a distance of 1500 miles, delivered them to the charge of the Rev. John Seys, government agent there; brought the prize to Norfolk, Va., in September, 1860; in December, 1860, ordered as lieutenant to receiving-ship "Princeton," at Philadelphia; served in her until April 23, 1861, on which day he was ordered to the Philadelphia City ice-boat, which had been improvised into a man-of-war in less than twenty-four hours, as executive; served in her in the Chesapeake, convoying transports with troops and munitions of war until the middle of May of same year; was then ordered to the frigate "Mississippi"; served in her as second lieutenant and executive in the Gulf Squadron until October 31, 1861, when he was ordered in command of the steamer "Water-Witch," serving in same squadron until April, 1862, when she was ordered North for repairs; while in com-

mand of the "Water-Witch," participated in several engagements with the enemy.

In June, 1863, was ordered to command the gunboat "Cimmaron"; served in her in South Atlantic Squadron, under Rear-Admiral Dahlgren, until May, 1864; while in her participated in the attack on the enemy's works before Charleston, August 17, 1863, and served in other engagements at the same place. In October, 1864, ordered to report to Acting Rear-Admiral Lee as ordnance-officer, Mississippi Squadron; in February, 1865, was transferred as executive-officer to the Mound City Naval Station, in which capacity he served until February, 1866; as light-house inspector of the sixth light-house district at Charleston, S. C., 1866–67.

Promoted to lieutenant-commander, July 16, 1862.

Promoted to commander, November 18, 1862.

Promoted to captain, February 10, 1869; commanding receiving-ship "Boston," 1870; commanding "Pensacola" (second-rate), Pacific Squadron, 1872–74.

Commissioned as commodore, February 4, 1875; commanding Naval Station, Port Royal, S. C., 1877–78; leave of absence, 1879; commandant navy-yard, Norfolk, Va., 1879–80.

Huissiers. The flat-bottomed transports in which horses were embarked in the Crusades.

Hulcock. A name for the *Squalus galeus*, or smooth hound-fish.

Hulk. A vessel condemned as unfit for the risks of the sea, dismantled, and used for harbor purposes; as, sheer-hulk, convict-hulk, etc.

Hull. The body of a ship independent of masts, sails, rigging, etc. *To hull*, to pierce the hull with shot. *A-hull*, the situation of a ship under bare poles with her helm lashed a-lee, and driving before wind and sea. *Hull-down*, a ship so far distant that her hull is below the horizon.

Hull, York County, England, is the third port in extent of business in the kingdom. Its docks and basins are very extensive and complete, surrounded by broad quays and large warehouses, and are crowded with shipping of all nations. The principal exports are cotton and woolen stuffs, yarn, etc. Its coasting-trade is highly important. Ship-building and its auxiliary manufactures, including boilers and steam-engines, are extensively carried on. Lat. 53° 44′ 36″ N.; lon. 0° 20′ W. Pop. 140,100.

Hull, Isaac, Commodore U.S.N., was born at Derby, Conn., on the 9th of March, 1775. He entered the merchant service at 12, and commanded a vessel at 19. Was appointed a lieutenant in the navy on the 9th of March, 1798.

He was first lieutenant of the "Constitution" on a cruise as flag-ship of Commodore Talbot in 1800, and was given command of an American sloop, the "Sally." In her he entered Port Platte, San Domingo, and cut out and carried to sea the "Sandwich," a privateer, rigging her in a short space of time. Returning home, he was commissioned a lieutenant at the reorganization of the service in 1801. He sailed from New York on the 10th June, 1803, in command of the "Enterprise"; in company with the "John Adams" captured a corsair, which blew up, June 22. On the arrival of the "Argus," November 11, he was transferred to her. He was promoted to master-commandant in April, 1804, assisted in the capture of a felucca, April, 1804, and participated in the actions of August 3 and September 28, off Tripoli, narrowly escaping capture on the 9th of August. Conveyed Gen. Eaton to Alexandria, and afterwards assisted that officer in the attacks on and capture of Derne, April 27, 1805. Returned home at the close of the war, and was made a captain, April 23, 1806.

On the breaking out of the war of 1812 he was in command of the "Constitution," in which ship in 1811 he carried specie to Ireland for payment of a debt in Holland, and was chased by a squadron, but escaped. Sailed again, July 12, 1812, and from the 17th to the 20th was chased by an English squadron of 7 vessels, escaping by the most consummate skill and seamanship. Sailing again on the 2d of August, he captured 5 merchantmen, and on the 19th, after a bloody fight, captured and destroyed the British frigate "Guerriere," 38. For this he was awarded a gold medal. He was a naval commissioner from 1815–17. Commanded the Pacific Fleet, in the frigate "United States," from 1824–27; leave of absence, 1828–29; navy-yard, Washington, 1830–35; leave of absence, 1836–37; waiting orders, 1838–39; commanded Mediterranean Squadron, 1840–41; on leave, 1842–43. Died at Philadelphia, February 13, 1843, aged 68.—*F. S. Bassett, Lieutenant U.S.N.*

Hull, Joseph B., Commodore U.S.N. Born in Westchester, N. Y. Appointed midshipman from Connecticut, November 9, 1813, joined the frigate "Congress" and went to Holland and the Mediterranean, 1815, returning in Commodore Bainbridge's Squadron; in the "Washington," 74, in the Mediterranean, 1816–17; transferred to the frigate "United States" in 1818, and returned in her to Norfolk in the summer of 1819; in 1820 attached to the Boston Navy-Yard; in the "Franklin," 74, Pacific Squadron, 1823, as passed midshipman; in 1824 ordered to schooner "Dolphin" as acting lieutenant; rejoined the "Franklin" and returned home in her in 1825.

Commissioned as lieutenant, January 13, 1825; in frigate "Constellation," West Indies, in 1827; ordered to sloop "John Adams," 1828, and returned home; in frigate "Guerriere," Pacific Squadron, 1829–31; attached to Washington Navy-Yard, 1831–33; in frigate "Potomac," Mediterranean Squadron, 1834–37; attached to receiving-ship at Boston from fall of 1839 to September 8, 1841.

Commissioned as commander September 8, 1841; in command of sloop "Warren," Pacific, 1843–46, to October, 1847, returning *via* Panama. While in command of the "Warren," off Mazatlan, sent in a boat expedition under Lieut. Radford (now rear-admiral), to cut out the Mexican gun-brig "Malekadhel," which was successfully done; was in command of the Northern District of California for a short period before the close of the Mexican war; commanding naval rendezvous, Philadelphia, from November, 1849, to December, 1851.

Commissioned as captain, September 14, 1855; in command of frigate "St. Lawrence," Brazil Squadron and Paraguay Expedition, 1856–59, returning in May; in command of the "Savannah," coast blockade, from June to September, 1861.

Commissioned as commodore, July 16, 1862;

superintending the building of gunboats at St. Louis, from June, 1862, until 1864, when he was transferred to Pittsburgh; in command of navy-yard, Philadelphia, from November 10, 1864, to January 1, 1866; president of Examining Board at Philadelphia from December 3, 1866, to July 8, 1867; light-house inspector for the first district, with headquarters at Portland, 1869–73. Total sea-service (1878), 22 years 3 months; shore and other duty, 17 years 6 months. Retired December 21, 1861.

Humber-keel. A peculiar clinchar-built craft used on the Humber.

Hummock. A hill with a rounded summit on the sea-coast. When in pairs they are termed *paps* by navigators. *Hummocks of ice*, protuberant lumps of ice thrown up by some pressure upon a field or floe, or any other frozen plane. The pieces which rise when large fragments come in contact, and bits of pack are frozen together and covered with snow.

Hump-backed Whale. A species of whalebone whale, the *Megaptera longimana*, which attains to 45 or 50 feet in length, and is distinguished by its low rounded dorsal fin.

Hunt, Timothy A., Commodore U.S.N. Born in Connecticut. Appointed from Connecticut, 1825; Pacific Squadron, 1827; Mediterranean Squadron, 1833–34.

Commissioned as lieutenant, December 17, 1836; receiving-ships, Boston and New York, 1840–43; frigate "Brandywine," East India Squadron, 1845; commanding ordnance-transport "Electra," 1847–48; navy-yard, Boston, 1850; frigate "Columbia," Home Squadron, 1853–55.

Commissioned as commander, September 14, 1855; ordnance duty, 1856–59; commanding steam-sloop "Narragansett," Pacific Squadron, 1860–61.

Commissioned as captain, July 16, 1862.

Commissioned as commodore, January 2, 1863; ordnance duty, Boston, 1862–67; special duty, New London, 1869–71; retired July 23, 1867.

Hurd. The strand of a rope.

Hurdigers. Particular artificers employed in constructing the castles in early ships.

Hurleblast. An archaic term for *hurricane*.

Hurricane. See STORMS, REVOLVING.

Hurricane-deck. A light deck over the saloon of a steamer. The upper deck of a river-steamer.

Hurter. A brass casting at either end of the slide of a gun-carriage for the trucks to take against.

Hurtle. To send bodily on by a swell or wind.

Husband, or Ships' Husband. An agent appointed by deed, executed by all the owners, with power to advance and lend, to make all payments, to receive the prices of freights, and to retain all claims. But this office gives him no authority to insure or to borrow money; and he is to render a full account to his employers. Also, a person who seldom leaves his ship.

Hush. A name of the lump-fish, denoting the female.

Hutch-hooks. Small pieces of oak used for temporary fastening of any work, generally placed over the heads of shores in building or in docking a vessel, secured to the vessel with riband-screws.

Hutt. The breech-pin of a gun.

Huz-zif. A general corruption of *housewife*, a very useful contrivance for holding needles and thread, and the like.

Hyades. The seven daughters of Atlas and Æthra; Ambrosia, Eudora, Coronis, Pasithoe, Plexaris, Pytho, and Tyche. They were changed by Jupiter into seven stars.

Hydra (Gr. *hudros*, the water-snake). A constellation to the south of Cancer, Leo, and Virgo. Its principal star, *α Hydræ*—called also *Cor Hydræ* and *Alphard*—may be found by continuing the line from δ and γ *Ursæ Majoris* through *α Leonis* to about half its length; the line through Castor and Pollux also points it out.

Hydraulic Block. A block placed under a ship in docking, and which is worked by a hydraulic pump, to be raised and lowered either at the bilge-blocks or at the keel-blocks.

Hydraulic Dock. An apparatus by which a vessel is raised clear of the water for examination and repairs by means of hydraulic presses. The vessel is brought over a platform suspended by chains passing over pulleys in the side-frame of the dock, and which are attached on each side to a strong beam connected with the cross-head of a hydraulic press.

Hydraulic Press. A machine in which the pressure of a piston or plunger of a pump acts upon a small area of a body of liquid, transmitting to a piston of larger area in a working cylinder a pressure or force proportional to the difference in area between the working piston and pump-plunger, and a speed inversely proportional to the difference. The pump draws liquid from a reservoir and forces it into the working cylinder; and when the return of the working piston is desired the liquid is released by a cock.

Hydrographer to the Bureau of Navigation. According to the organization of the U. S. Hydrographic Office, "the officer in charge will be the hydrographer to the Bureau of Navigation, and will be responsible for everything emanating from that office." The regulations of the bureau go on to say, "From intercourse with foreign hydrographic offices, from information received from our naval vessels and mercantile marine, together with the perusal of hydrographic publications, etc., he is expected to be acquainted with what has already been done and is doing in this branch, and to point out what may be desirable from time to time to accomplish." The hydrographer has the superintendence and general control of the various divisions of which the hydrographic office is composed; to him the head of each division refers any matter out of the ordinary routine of duty for decision. The position has always been held by an officer not below the rank of commander; he has not been appointed for any special period, but has been retained at the pleasure of the Navy Department.

There is an assistant hydrographer attached to the office, whose duty it is to act in the absence of the hydrographer, and also to assist him in any of the duties of the office.

The regulations of the bureau which established the position of hydrographer were not approved until January 21, 1871, although the act creating the hydrographic office was approved June 21, 1866. There was in the interval a chief of the office corresponding to the present hydrographer; but it does not appear that he had any title until

the approval of the regulations above referred to. Since the passage of the act creating the Hydrographic Office, the following-named officers have been at its head, viz.: Commander Fillebrown, Capt. N. B. Harrison, Commander Simpson, Commodore Emmons, Capt. Wyman,—who also continued in the position as commodore and rear-admiral,—Capt. Franklin, and Capt. De Krafft, the present incumbent. All maritime nations of any importance have a position corresponding to that of the hydrographer, which is filled, as with us, by naval officers of the different grades.—*S. R. Franklin, Captain U.S.N.*

Hydrographic Office. The act of Congress entitled An act to establish a Hydrographic Office in the Navy Department was approved June 21, 1866.

Before the passage of this act the charts for our naval vessels were issued from a number of different places which, from time to time, were used as depots of charts. About the year 1835 the Depot of Charts was a house on G Street between 21st and 22d Streets. From G Street, prior to the sailing of the U. S. Exploring Expedition, it was removed to a house on North Capitol Street, owned by Lieut. Wilkes. From Capitol Hill it was moved to a building on Pennsylvania Avenue, opposite to what is now the Columbia Hospital, and known as the Forsyth House. When the Observatory was completed the charts were issued from there, and in 1866, upon the establishment of a Hydrographic Office, which was located at the corner of 18th Street and New York Avenue, they were moved to that building, which building continued to be the Hydrographic Office until its removal to the Navy Department in 1879. The Hydrographic Office is now an annex of the Bureau of Navigation, but formerly everything connected with Hydrography was subject to the Bureau of Ordnance and Hydrography. When the Bureau of Navigation was created all matter relating to that subject was transferred to it.

This office is divided into the following departments, viz.: Division of Archives, etc., Chart Division, Meteorological Division, Division of Drafting and Engraving, and Division of Longitudes. There is also a library connected with the office, which contains technical and other works.

The Division of Archives is in charge of a naval officer, whose duty it is to collect and file all hydrographic information, and issue the same in the form of hydrographic notices and notices to mariners, which are disseminated for the benefit of navigation and are sent gratuitously to any masters of vessels or others interested in maritime affairs who may desire them. In the files of the archives are kept all the data of original surveys, and everything appertaining to that subject.

The Chart Division, which comprises the charts of this office and the British admiralty charts, is also in charge of a naval officer. From this division are issued all the charts to United States ships of war, and also to the agents at the important seaports of the United States, by whom they are sold to mariners at the cost of printing and paper. This division has charge also of the printing of the charts. The Meteorological Division is in charge of a naval officer, who, with his assistants, is employed in collecting and collating data for the construction of meteorological charts, intended finally to comprise the whole navigable ocean.

The Division of Drafting and Engraving is in charge of a hydrographic expert whose duty it is to superintend the drafting and engraving of all charts published by the office, and to see that the plates are corrected in accordance with the latest hydrographic information.

The Division of Longitudes is conducted by a naval officer, and when there is a doubtful question of the longitude of any point under consideration, this division investigates all the authorities upon the subject before the matter is finally decided. It is at present engaged in collecting the latitudes and longitudes of the important seaports of the world from the latest and most reliable authorities. The most important work, however, upon which it is engaged, and that upon which its other work chiefly depends, is the reduction of the observations for secondary positions of longitudes as determined by electric cable, by parties under the command of Lieut.-Coms. Green and Davis.

The librarian is a naval officer, whose duty it also is to see to the correction of nautical books and sailing directions, and to their issue to naval vessels and to the agents of the office.

In order that mariners may receive the publications of the office at the lowest possible rate, the law makes it obligatory that they be sold at the cost of printing and paper.—*S. R. Franklin, Captain U.S.N.*

Hydrography. The general term Hydrography is now used to include a description of the navigable waters of the earth, their contour and character, of the rocks and shoals likely to endanger navigation, the tides, currents, and depths of all navigable waters, of ocean meteorology, and of the best methods to adopt in making passages from one port to another. The same word is used to designate the art of making charts which shall show this varied information in a convenient form for the navigator.

As such work is, generally speaking, too extensive and costly to be carried on by private individuals, all maritime nations of importance have found it necessary to establish as a part of their administrative system a hydrographic office, the functions of which are substantially the same for all countries and comprise the conduct of hydrographic surveys, the preparation and publishing of charts and sailing directions, the issuing of charts and books to government vessels and supplying them through agents to the mercantile marine, and the constant international interchange of all information which may be of service to the navigator. If war were not to be apprehended, each government need only concern itself with the charts of its own shores, procuring necessary charts of other parts of the world from foreign officers; but as at any time such a supply would be subject to interruption, the hydrographic office of each prominent maritime nation seeks to supply its public and private ships with charts of all parts of the world, thus being independent in case of hostilities. The English government have published nearly or quite 3000 different charts, and the French about the same number. In the United States the hydrographic establishment is divided into two branches,—the U. S. Coast and Geodetic Sur-

vey, under the Treasury Department, dealing exclusively with the coasts of the United States, of which about 350 charts have been published, and the Hydrographic Office attached to the Navy Department, and engaged in the construction of charts of foreign coasts, of which about 700 have been published. This office also supplies all vessels of war with the necessary charts and books, and disposes of its publications through agents to the mercantile marine and others. An extensive and mutually valuable exchange of information is constantly going on between the hydrographic offices of the United States, England, France, Denmark, Norway, Sweden, Russia, Spain, Italy, Austria, Portugal, Holland, Belgium, Germany, India, Japan, Brazil, Buenos Ayres, and Chili, resulting, in 1879, in the publication by the U. S. Hydrographic Office of 87 *hydrographic notices* relative to discoveries and changes in the natural features of navigable regions, and 119 *notices to mariners* relating to additions to and changes in artificial aids to navigation. These form a yearly synopsis of the hydrographic work of the world.

The general object of the hydrographic survey of a coast-line is to produce such a chart that every part of the coast may be readily recognized and safely approached or passed by a stranger, and that its ports may be safely entered and left without the aid of a pilot. In addition to the charts of the coast-line, information as to the depth, current, and temperature of the sea is of great importance to the navigator, and is when known incorporated into the chart. See CHART, COAST SURVEY, DEEP-SEA SOUNDING.

It is only since the middle of the 18th century that accurate hydrographic surveys have been effected by the officers of various nations,—Capt. J. Cook, of the English navy; Des Barres, another Englishman, and Admiral Beautemps-Beaupré, of the French navy, being among the pioneers in this work.

As regards the extent of foreign coast-line surveyed, England is in advance of all other nations, and the work of her naval surveyors is of marked excellence. Although the surveys of foreign coasts by officers of the United States navy are by no means as extensive, their work is of a very high character, and the hydrographic survey of the coast of the United States compares favorably with any other work of the kind.

The surveys which have been made of coast-lines vary largely in quality, and may be divided into three classes, viz.: 1st. Complete triangulated surveys, where the adjacent waters have been thoroughly examined, leaving nothing to be desired in the way of information for the navigator; 2d. Running surveys made from ships, giving accurate plans of the harbors, but only approximately correct coast-lines; and 3d. Reconnoissances, where only the general direction and aspect of the coast is given, and where the navigator must be constantly on his guard against hidden dangers.

The surveys of the Atlantic coast of the United States, with those of England, France, Germany, and one or two other European nations, are the only ones to be placed without reserve in the first class, while those of by far the largest part of the earth's coast-line are embraced in the second class. The surveys of New Guinea, a majority of the Pacific and East India Islands, parts of the coasts of Africa and South America, and the Arctic and Antarctic regions are to be included in the third class.

No branch of hydrographic knowledge has received such great accessions during the last few years as that relating to the depths, temperature, and chemical constituents of the great oceans. In addition to the knowledge derived from the surveys of the United States ships "Tuscarora," "Essex," and "Blake," the English ships "Challenger" and "Alert," and the German ship "Gazelle," vessels engaged in laying submarine telegraph cables are constantly adding to our knowledge of the depths of the sea.

For an account of the various methods in use in marine-surveying the reader is referred to "General Instructions for Hydrographic Surveyors," published by the U. S. Navy Department; the annual "Report of the U. S. Coast and Geodetic Survey;" "Nautical Surveying," by Capt. W. N. Jeffers, U.S.N.; "Nautical Surveying," by Capt. E. Belcher, R.N.; "Practical and Theoretical Nautical Surveying," by Prof. J. K. Laughton; "Deep-Sea Sounding and Dredging," by Lieut.-Com. C. D. Sigsbee, U.S.N.; and "Cours de Navigatione et d'Hydrographie," by E. Dubois.—*F. M. Green, Lieutenant-Commander U.S.N.*

Hydrometer. An instrument for ascertaining the specific gravity or relative density of liquids. It is made of glass or metal, and consists of a hollow bulb or float provided with a slender stem which is graduated to any arbitrary scale suitable to the purpose for which it is used; projecting from the bottom of this bulb is a smaller one filled with shot or mercury for the purpose of keeping the instrument upright.

Hygiene, Naval. Though the principles of hygiene are pretty much the same everywhere, the practice on board ship presents some peculiarities, some difficulties: good or pure air; pure water, and enough of it; good food, enough and of such varieties as afford proper nourishment; proper employment for mind and body, without excessive labor; good discipline and other comfortable surroundings, are all necessary. Ever since Ulysses, on his raft, removed some of his clothes to enable him to swim ashore (Odyssey), human ingenuity has been contriving means to save life and to preserve health on the ocean.

Ventilation.—Pure air is sufficiently abundant on the wide ocean, so that proper ventilation is the main question with reference to this matter. Respired air has about the temperature of the human body, something near 37°.78 C. (= 100° F.); it is much warmer than the air of any habitable apartment, so that, in obedience to diminished specific gravity, it ascends, escapes by the hatches; thus any small vessel is sufficiently ventilated if only the hatches can be kept open But as the vessels increase in size the difficulties increase in such a way that the larger the vessel the more numerous the sick-list, the greater relative mortality, notwithstanding the great improvement in most other respects. The large ship is subdivided into many apartments, some of them not so well arranged as they might be, and they contain chests of dirty clothes, packages of spoiled cheese, and sometimes worse things; the air cannot remove everything bad about such things unless it has a fair chance. Devices for

mechanical ventilation have been very numerous, and though each one has been useful under the careful supervision of the inventor, all of them, ancient and modern, have failed in general utility: the foul-air pump, the bellows, and the fans are all effective in moving the air that comes within their influence, but the openings of the machines cannot reach every accumulation of foul air, or rather do not; and hence, with all their labor and expense, these machines merely circulate to the next aperture the air that comes within their power. In vessels of the monitor class it has been made possible, by the use of fans propelled by steam, to introduce air at one end and discharge it at the other, and by way of variety at both ends, so as to ventilate the interior and supply air for the furnaces at the same time. Formerly there was much inconvenience from impure air caused by bilge-water, and from decaying fragments of provisions and cargo; but this is so well understood and so easily remedied by keeping the ship dry and clean that the matter should no longer be of much interest, except as a matter of history.

Crowd-poison and typhus.—Poor ventilation and crowding, besides general ill health, cause typhus fever, a specific disease, and most fatal contagious pestilence. It seems that the mere perspiration of our bodies, unless promptly removed by free circulation of air, becomes very quickly a terrific poison (ochlesis, crowd-poison), which thus killed great numbers of our immigrants from Europe. Ships arriving with crowds of passengers had many deaths, and the sick were transferred to the quarantine stations, whence the disease was communicated to physicians and nurses at the hospitals; there were many deaths from this so-called ship-fever, until by Act of Congress (May 3, 1855), this was remedied. The law contains the following among other essential provisions:

1. The number of passengers shall not exceed 1 for each 2 tons measurement.
2. The apartments shall not be less than 6 feet in height.
3. Each passenger shall have from 14 to 18 feet of floor space, varying according to height and position, and giving about 100 cubic feet.
4. Every vessel with capacity for 100 passengers shall have 2 ventilators, 1 at each end, and 1 of them fitted with an exhausting cowl.
5. These arrangements are enforced by sufficient fines and other penalties.

Coolie ships.—Curious as it may seem, crowds of passengers have been smothered to death on board "coolie" ships, both English and American, within the last 25 years.

Water supply.—Pure water is essential to health and well-being; and generally there need be no difficulty in procuring it. Distilled water is even too pure, but by aëration and the slight mixture of sea-water, unavoidable, it becomes pleasant and wholesome; and, curious as it may seem, distilled water is generally cheaper than spring water. Formerly the supply of water was a difficult matter; it was carried in wooden casks, which occupied much space and spoiled the water, so that 4 or 5 pints a day was considered a liberal allowance of the disgusting fluid. The first great improvement was the introduction of iron tanks to preserve the water, and next the simple devices, not yet generally understood, for rendering distilled water palatable. The selection of spring-water calls for some care and judgment. There is no need here for any elaborate chemical analysis, as in arranging for city supplies. Limpid water from the hills is pretty surely good unless it has a decidedly objectionable flavor or a bad local reputation. It is important to avoid small streams in which clothes are washed, into which dirt is thrown, and streams which drain marshy land. This caution at first sight seems superfluous, but it is curious to see with what carelessness dirt is mixed with drinking-water nearly everywhere, from London to Memphis, as well as on shipboard.

Food.—The supply of suitable food is a real difficulty; we may carry salt beef and salt pork, hard bread and dry beans, flour and dried apples, tea and coffee, but no cabbage from the garden or other green thing. The importance of fresh vegetables is quite incomprehensible. In September, 1740, Lord Anson's fleet sailed from England, and in September, 1741, three of the ships reached the island Juan Fernandez, on the west coast of South America; of the 961 men who sailed 325 were alive; 636 had died mostly of scorbutus (sea-scurvy) during the passage around Cape Horn. The first boat that landed was loaded with grass and such weeds as came to hand. The poor invalids on board ate it up as delicious food, and rapidly regained their strength. This terrific record is in accordance with the experience of the time. The Spanish fleet attempting the same voyage at the same time fared about as badly, and the shattered remnant returned to Montevideo; not one of their seven vessels reached the Pacific, and about half the men died in the attempt.

Improvements.—This difficulty in long voyages being understood, there has been a steady improvement to the present time. Cook's voyages of exploration, the third of a century later, were made with very little loss of life; this is partly due to improved knowledge and hygienic care, and partly to the fact that the passages were short from one landing-place to the next, and much of the time was spent about lands where fruits and fresh vegetables were procurable. At present it is no rare thing for a ship with 200 or 300 men to round Cape Horn, make a three years' cruise in the Pacific, bringing home every man that sailed in her; and there is no one or two great things to be pointed out as the cause of this great difference. There is a better and more abundant supply of food, better discipline, more thoughtfulness, more intelligent attention to small things. We can mention only a few of the more important changes.

Flogging abolished.—The abolition of flogging, after many regulations mitigating and rendering it less necessary, came in accordance with the demands of public sentiment (1850). This gave the men spirit to think themselves somewhat better than beasts, and they behaved better accordingly. It did much to infuse new life into the degraded men; it prevented the novices from reaching such a degree of degradation; and now the other tortures invented to supply its place are gradually passing to oblivion.

The liquor ration abolished.—The abolition of the liquor ration (1862) was still more important. This had to be gradual. For twenty years or

more the allowance was reduced from time to time, with coffee and tea, and many other things experimentally supplied as substitutes. The cessation of drunken habits has rendered it possible to indulge sailors with frequent liberty on shore, without the filth and disorder formerly in fashion. There is ten times as much liberty, with perhaps one-tenth as much syphilis.

Coffee and spices.—Furthermore this great improvement—from 650 deaths per 1000 in Lord Anson's fleet to 4 or 5 per 1000 in late official reports—has come by more persistent care about small things. Ground coffee, formerly supplied by contract, was a vile mixture of spoiled coffee, with beans and chicory, etc., parched and ground together. The mustard called English mustard was mostly starch and saw-dust, with potassium bichromate enough to make it pungent; the whole seeds are now purchased and manufactured under responsible supervision.

Fresh bread and early coffee.—The hard bread on board is now varied by a constant supply of fresh bread; a competent "ship's baker," with his oven, belongs to the complement of every ship in the navy. Congressional legislation (May 23, 1872), in its liberal supply of coffee, has even prescribed the proper time to use it,—"an additional ration of coffee and sugar to be served at his first turning out." The man who is obliged to spend the morning hours from 5 o'clock to 8 A.M. in scrubbing decks and making things neat till breakfast-time fully appreciates this preliminary bread and coffee.

Naval experience has made important contributions to medical science and general hygiene, as appears by the accumulating reports of medical officers; perhaps the most important of these has reference to malarial fevers. When the distinctions between the deadly marsh fevers of the tropics and yellow fever were hardly suspected, Dr. Badenoch, July 7, 1768, read a paper on this subject before the Royal Society of Edinburgh. His ship had been at the Comore Islands (Mozambique Channel) for ten days, and a few days after sailing many men sickened and died in quick succession; of course it was generally thought to be a terrible contagious pestilence that destroyed lives in this way, but "I observed that none suffered of those who returned on board to sleep every night." All those who were on shore at night suffered; all who came aboard to sleep escaped. Lind published very similar incidents, and subsequent experience all accords with this. Hence the well-established facts: malarial poison infects only at night, and the incubation period is not less than twelve or fourteen days. If we wish to learn when or how a patient contracted his disease, we need not ask where he was last night or yesterday, but where he spent his nights two weeks ago. Even medical men of eminence do not always keep these things in remembrance; for instance, in an admirable work on military hygiene (1860) there occurs such a slip as this: "The malaria seems to be principally active at night, as many men are attacked while on post early in the morning." The men had probably been thus exposed every night for two weeks or more. And again (1878), we read of a national vessel at Monrovia, Liberia; in three or four days after anchoring there were numerous cases of malarial fever on board; and hence the inference that the vessel is anchored too near the marshy shore, the fact being quite neglected that two weeks previously the ship was at Porto Praya, and probably the disease was contracted there.

Bibliography.—The most important books on this subject are the volumes of official reports of naval surgeons published by public authority nearly every year. Armstrong, "Naval Hygiene," 1858; Blane, "Dissertations," 3d ed., 1803; Clarke, "Long Voyages," 1792; Carpenter, "Use and Abuse of Alcohol"; Dunglison, "Human Health"; Fonssagrives, "Traité d' Hygiene Navale," 2d ed., 1877; Forget, "Naval Medicine," 1835; Gihon, "Naval Hygiene," 1873; Hammond, "Military Hygiene," 1863; Larrey, "Surgical Memoirs"; Lind, "Marsh Fevers of Bengal," pamphlet, 1770; Lind, James, "On Scurvy," London, 1757; Lind, James, "Diseases in Hot Climates," Philadelphia, 1811; Maher, "Hygiene Navale," 1874; Plimsoll, "Our Seamen," 1873; Turnbull, "Naval Surgeon," 1806; Turner, "Hygiene, Naval and Merchant," in Buck's "Hygiene," 1880; Wilson, "Naval Hygiene," 2d ed., 1879.—*Joseph Wilson, M.D., Medical Director U.S.N.*

Hygrometer (Gr. *hugros*, moist; *metrein*, to measure). An instrument for measuring the moisture of the atmosphere. The simplest form consists of a combination of two thermometers, the bulb of one being kept dry and that of the other wet. The wet bulb is cooled by evaporation as much as the state of the atmosphere admits. In a very moist atmosphere there will be little or no difference in the readings of the two thermometers, but when the atmosphere is dry the wet-bulb thermometer will show a temperature lower by several degrees than that shown by the dry-bulb thermometer.

I.

Icarus. The son of Dædalus, who, flying with his father out of Crete into Sicily, and soaring too high, melted the wax of his wings and fell into the sea, thence called the Icarian Sea.

Ice. Water or other liquid made solid by cold. Water freezes at 32° F., and in freezing expands rapidly and with great force. In consequence of this expansion the ice becomes lighter than water, and floats with one-ninth of its mass above water.

ICE-ANCHOR. A bar of round iron tapered to a point, and bent as a pot-hook; a hole is cut in the ice, the point entered, and a hawser bent to the shorter hook; by this vessels ride safely till any motion of the ice capsizes it, and then it is hauled in. The ice is usually entered by a lance, which cuts its hole easily.

ICE-BEAMS. Strengtheners for whalers.

ICEBERG. An insulated mountain of ice, whether on Arctic lands or floating in the sea. Some have been known to be aground in 1500 feet water, and rise to the height of 250 feet above it. Cook's obtaining fresh water from floating icebergs was not a new discovery. The Hudson's Bay ships had long made use of it; and in July, 1585, Capt. Davis met with ice "which melted into very good fresh water."

ICE-BIRDS. Small sea-fowl in the polar regions.

ICE-BLINK. A streak or stratum of lucid whiteness which appears over the ice in that part of the atmosphere adjoining the horizon, and proceeds from an extensive aggregation of ice reflecting the rays of light into the circumambient air.

ICE-BOAT. A heavy boat with great steam-power, for breaking a passage-way through ice. A boat fitted with runners shod with iron for sailing on the surface of the ice. They have one large sail, and lie up very close to the wind. In this situation their speed is greater than the velocity of the wind.

ICE-BOUND. A vessel so surrounded by ice as to be prevented from proceeding on her voyage.

ICE-CHISEL. A large socket-chisel into which a pole is inserted, used to cut holes in the ice.

ICE-CLAWS. A flat claw with two prongs spread like a can-hook.

ICE-FENDERS. Fenders of any kind, used to protect a vessel from injury by ice.

ICE-LANE, or ICE-VEIN. A narrow temporary channel of water in the packs or other large collections of ice.

ICE-MASTER. A pilot, or man of experience, for the Arctic Sea.

ICE-PLANK. See SPIKE-PLANK.

ICE-QUAKE. The rending crash which accompanies the breaking of floes of ice.

ICE-SAW. A huge saw for cutting through ice; it is made of $\frac{5}{8}$ to $\frac{3}{4}$ inch plates of iron, and varies in length from 10 to 24 feet.

ICE-SLUDGE. Small comminuted ice, or bay-ice broken up by the wind.

ICE-TONGUE. A mass of ice projecting horizontally under water from an iceberg or floe.

Ichthyosaurus (Gr. *ichthus*, a fish, and *sauros*, a lizard). A genus of extinct marine animals which combined the characteristics of Saurian reptiles and of fishes, with some of the peculiarities of the Cetacea. The head was large, and resembled in structure that of the crocodile, except that the orbit was much larger, and the nostrils were placed, not as in the crocodile near the point of the snout, but close to the anterior part of the orbit. The teeth, conical in shape and hollow, were lodged close together in a continuous groove, in which the divisions for sockets, which exist in the crocodile, were indicated by the vertical ridges on the maxillary bone. The most remarkable feature in the head was the eye, which was not only very large,—in some specimens measuring 13 inches in diameter,—but was specially fitted to accommodate itself for vision in air or water, as well as for speedily altering the focal distance while pursuing its prey. The structure which thus fitted the eye so remarkably to the wants of the animal consisted of a circle of 13 or more overlapping sclerotic bony plates surrounding the pupil, as in birds. This circle acted as a sort of self-adjusting telescope, and with the extraordinary amount of light admitted by the large pupil, enabled the ichthyosaurus to discover its prey at great or little distances, in the obscurity of the night, and in the depths of the sea. The body, shaped like that of a fish, was furnished with limbs developed into paddles, and terminated in a long lizard-like tail, which is supposed to have been supplied with a vertical fin.

From the form and position of masses of crushed and apparently half-digested fish-bones and scales in the abdominal cavity of the ichthyosaurus, it is concluded that it preyed chiefly on fish.

The remains of the ichthyosauri are peculiar to the Secondary strata. They occur in the various members of the series from the Lower Lias to the Chalk, but have their greatest development in the Lias and Oolite. More than 30 species have been discovered, differing from each other mainly in the form of the head, some having a long and slender snout, like the gavial of the Ganges, and some a short and broad head, more like the common crocodile.

Ick. A term for a creek or gullet.

Ide. A small fish (*Leuciscus idus*) allied to the graining, and found in the northern parts of Europe.

Idler. A general designation for all those on board a ship-of-war who are not required to keep watch on deck. A cog-wheel placed between two others to communicate the motion of one to the other; by its interposition they are caused to revolve in the same direction.

Idoleers. The name by which the Dutch authorities are known in their oriental colonies,

the designation being a corruption of *edle herren.*

Ignorance. If a loss happen through the ignorance of the master of a ship, it is not considered as a peril of the sea, consequently the assurers are not liable. Nor is his ignorance of admiralty law admissible as an excuse.

Iguana. A lizard used for food in tropical climates.

Ilde. An archaic term for *island.*

Ilet. See EYELET.

Immer. The *Colymbus immer* of Linnæus; the great plunger of Buffon.

Immersion (Lat. *immergere*, to plunge in). The commencement of an occultation, or the moment when the occulted body disappears behind the nearer one.

Imp. One length of twisted hair in a fishing-line.

Impact (Lat. *impingere*, *impactum*, to push, strike against). In mechanics, the single, instantaneous blow or stroke of a body in motion against another, either in motion or at rest.

Impetus (Lat. *force*, from *impetere*, to rush upon, attack). In mechanics, nearly synonymous with momentum, yet differing from it as indicating the origin and intensity of motion, rather than its quantity or effectiveness. In gunnery, impetus is the altitude through which a heavy body must fall to acquire a velocity equal to that with which the ball is discharged from the piece.

Imports. The articles brought into the country in the course of commercial transactions. By the articles for the government of the navy all persons connected with the navy are forbidden to import in a naval vessel any thing which is liable to the payment of duty.

Impressment. The act of seizing for public use, or of impressing into public service; compulsion to serve. In England impressment was formerly a means much resorted to for supplying the royal navy with seamen. The practice, according to Lord Mansfield, was "deduced from that trite maxim of the constitutional law of England, 'that private mischief had better be submitted to than that public detriment and inconvenience should ensue.'" Seamen, river-watermen, and at times landsmen were the customary victims of this arbitrary procedure. A press-gang could board a merchant vessel or privateer of its own nation in any part of the world, and carry off as many men as could be taken without actually endangering the vessel. Although the laws which sanctioned impressment have not been repealed, the adoption of a system of bounties has in recent times proved a sufficiently effective means of procuring seamen without recourse to the oppressive practice of former years. One of the principal causes of the war between this country and England (1812–15) was the assertion by the latter of a right to impress English seamen out of American vessels on the high seas, thus elevating a practice which derived its warrant solely from the municipal law of England into a right sanctioned by the law of nations. This asserted right, sufficiently aggravating when confined in practice, as it was in theory, to subjects of Great Britain serving in American ships, became intolerable when extended to native-born-Americans owing no allegiance to the British crown. This was constantly done, the English boarding-officers acting, in effect, on the principle that the seaman who failed to prove that he was an American should be seized as an Englishman, and it has been authoritatively stated that the number of impressed Americans on board British ships of war was seldom less than the entire number of seamen in the United States navy between the years 1802 and 1812. On the declaration of war in the latter year, the number that was turned over to the prison-ships for refusing to fight against their own country is said to have exceeded 2000. Impressment has never been adopted in our country. There is nothing (remarks Judge Tucker) in the Constitution of the United States which warrants a supposition that such a power as that of impressment can ever be authorized or exercised under the government of the United States. On the contrary, the principles of the Constitution and the nature of the government strongly militate against the assumption or countenancing of such a power.

IMPRESS-GANG. A party of officers and men engaged in the act of impressment. More commonly called *press-gang.*

Impulse. In mechanics, the single or momentary force by which a body is impelled, in contradistinction to continued force; force communicated without appreciable gradations; motion produced by suddenly communicated force.

In. Within; on board. The situation of a sail when it is furled; *to take in* a sail, to clew it up preparatory to furling. *In boats!* the order to hoist in the boom-boats. *In bows!* the order to the bow-oarsmen to lay their oars in. *In the wind*, the situation of a ship so close to the wind that the sails shiver.

In-and-out Bolts. The bolts that are driven through the ship's side.

Inboard. Within the hull of a vessel. Nearer the centre-line.

Incendiary Shell. A shell filled with a highly-inflammable composition, for the purpose of setting fire to buildings; a carcass.

Inchcape Bell. Tradition says that the abbots of the ancient monastery of Aberbrothrock fixed the bell in such a manner that it was rung by the heaving of the sea, thus warning mariners of their danger. Tradition also tells us that the bell was carried away by a Dutchman, who, with his ship and crew, was afterwards lost upon the rock. The site is now occupied by a fine light-house, which was erected in 1806–10.

Incidence, Angle of. A term which is used by writers on Mechanics and Optics in different senses. Thus, in the case of a body striking against a plane the angle of incidence is by some understood to signify the angle formed by the line in which the body moved with a straight line perpendicular to the plane; while others use the term to denote the angle which the line of incidence makes with the plane itself. When light or any elastic body is reflected from a surface, the angle of incidence is equal to the angle of reflection; and in case of refraction, the sine of the angle of incidence has to the sine of the angle of refraction a constant ratio.

Inclinatory Needle. An old term for the *dipping needle* (which see).

Inclined-cylinder Steam-engine. One in which the axis of the cylinder is inclined to the

horizon, in contradistinction to the horizontal and vertical types. Called also *inclined-engine.*

Incompetency, or Insufficiency. A bar to any claim on warrantry, as it is an implied condition in the seaworthiness of a ship that at sailing she must have a master of competent skill, and a crew sufficient to navigate her on the voyage.

Incrustation. The deposit from the water, adhering to the inside of a boiler. See SCALE.

Indemnification. A stipulated compensation for damage done.

Indemnity. Amnesty; security against punishment.

Indentures, Pair of. A term for *charter-party.*

Independence, Declaration of. The written instrument adopted by the Continental Congress assembled at Philadelphia on the 4th of July, 1776, whereby the 13 American colonies declared their independence of the crown of Great Britain. This memorable instrument asserts the right and duty of a people, whenever their form of government becomes destructive of the ends for which governments are instituted, to wit: the security of life, liberty, and the pursuit of happiness, to throw off such government and to provide new guards for their future security. It recapitulates the oppressions of the British king, and closes with the following solemn appeal and declaration: "We therefore, the Representatives of the United States of America, in General Congress Assembled, appealing to the Supreme Judge of the world for the rectitude of our intentions, do, in the Name, and by Authority of the good People of these Colonies, solemnly publish and declare, That these United Colonies are, and of right ought to be, Free and Independent States; That they are Absolved from all Allegiance to the British Crown, and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved; and, that as Free and Independent States, they have full Power to levy War, conclude Peace, contract Alliances, establish Commerce, and to do all other Acts and Things which Independent States may of right do. And for the support of this Declaration, with a firm reliance on the Protection of Divine Providence, we mutually pledge to each other our Lives, our Fortunes, and our sacred Honor."

Index. The flat bar which carries the index-glass of a quadrant, octant, sextant, etc. The integer part of a logarithm.

INDEX-ERROR. A correction to be applied to the reading of an astronomical instrument. See SEXTANT.

INDEX-GLASS. A mirror which moves with the index of an astronomical instrument, and reflects the image of the sun or other object upon the horizon-glass, whence it is again reflected to the eye of the observer.

Indiaman. A term occasionally applied to any ship in the East India trade, but in strict parlance the large ships formerly officered by the East India Company for that trade, and generally armed.

Indicator. An instrument, originally invented by Watt for recording, by means of a diagram, the pressure per unit of area upon the piston of a steam-engine at all points of its stroke. From the diagram, which is drawn upon a piece of paper called an *indicator card*, the mean pressure throughout the stroke may be ascertained, and mal-adjustment of valves or leakage through valves, piston, or other parts of the cylinder detected. The instrument consists essentially of a small vertical cylinder, open at the top and communicating at the bottom with the engine-cylinder, provided with a delicately-fitting piston of accurately determined area, which is held in position by a spiral spring of known tension, so that the pressure of steam on the bottom of the piston or that of the atmosphere on the top will be indicated by a pencil attached to a rod of the small piston by suitable mechanism. The pencil is brought to bear upon a piece of paper closely wrapped around a cylinder, which is caused to partially revolve in alternate directions by a motion coincident with that of the piston of the engine while the pencil is moving up and down, thus describing an irregular continuous line inclosing a space, the area of which represents the unbalanced pressure on the engine-piston. The vertical ordinate of any point of the line, when measured with a scale corresponding to the stiffness of the spring, indicates the pressure per unit of area at that point, and the mean of a number of ordinates gives the mean pressure throughout the stroke.

INDICATOR CARD. A piece of paper on which an indicator diagram is drawn. Upon the card should be noted the pressure of the steam per gauge in the boilers; the vacuum in the condenser per gauge; reading of barometer; the revolutions of the engines per minute; the relative amount of opening of the throttle-valve; temperatures of the air, injection- or sea-water, discharge-water, and hot-well; the direction and force of the wind relative to the ship; the state and direction of the sea; the amount of sail set; and any abnormal condition of the machinery. These notes should be made at the instant the diagram is taken, and the card should bear the name of the vessel, the date, and the exact hour and minute of taking.

Indraught. A particular flowing of the ocean towards any contracting part of a coast or coasts, as that which sets from the Atlantic into the Straits of Gibraltar. It usually applies to a strong current apt to engender a sort of vortex.

Induction-pipe. The main steam-pipe of the steam-engine, conducting steam from the boiler to the steam-chest.

Induction-valve. The main steam-valve, or valve admitting steam from the steam-chest to the cylinder.

Indulto. The duty formerly exacted by the crown of Spain upon colonial commodities.

Indus. See CONSTELLATION.

Inertia (Lat. *iners*, slothful). That inherent property of matter which renders all bodies absolutely passive or indifferent to a state of rest or motion, so that they would continue forever at rest, or persevere in the same uniform and rectilinear motion, unless disturbed by the action of some extrinsic force. The ancients attributed to matter a certain inaptitude or reluctance to motion; but that a body in motion required the operation of an extrinsic cause to bring it to rest was first discovered by Galileo. Kepler, conceiving the disposition of a body to maintain its motion as indicating an exertion of power, prefixed the word *vis;* and the compound expression *vis inertiæ*, though less accurate, has been generally retained.

Inferior Conjunction. See CONJUNCTION.

Inferior Planets. See PLANETS.

Ingraham, Duncan Nathaniel, Captain U.S.N. Born in Charleston, S. C., December 6, 1802; died there June 10, 1863. Midshipman, June 18, 1812; lieutenant, April 1, 1818; commander, May 24, 1838; captain, September 14, 1855. Nathaniel, his father, was a friend of Paul Jones, and was in the action with the British brig "Serapis." His uncle Joseph, Captain U.S.N., was lost at sea in the U. S. ship "Pickering." His cousin, William, a lieutenant in the navy, was killed at the age of 20. Capt. Ingraham married Harriet R., granddaughter of Henry Laurens. His seizure of Martin Kostza, an American citizen, from the Austrian brig-of-war "Hussar," at Smyrna, July 2, 1853, gave rise to an elaborate discussion at Washington between M. Hulseman, the Austrian chargé d'affaires, and Mr. Marcy, Secretary of State. Congress, by joint resolution, August 4, 1854, requested the President to present a medal to him for his conduct on this occasion. In March, 1856, he was appointed chief of the Bureau of Ordnance and Hydrography, which position he resigned February 4, 1861, and was made chief of ordnance, construction, and repair in the Confederate navy.

Inia (*Inia Boliviensis*). A cetaceous animal of the family *Delphinidæ*, in form resembling a dolphin, with a long and slender snout. It is the only known species of its genus, and is one of the few Cetacea which inhabit fresh water. It is found in some of the upper tributaries of the Amazon and in the lakes near the Cordilleras. It is from 7 to 12 or 14 feet long. Its food consists of fish. It is generally found in little troops of three or four, and is taken for the sake of the oil which it yields. The females show great affection for their young.

Initial Velocity. See VELOCITY.

Injection. In the steam-engine, a stream or jet of water admitted to the condenser for the purpose of condensing the steam after having performed its work.

INJECTION-COCK, or INJECTION-VALVE. A cock or valve by which the quantity of injection-water is governed.

INJECTION-, or JET-CONDENSER. A condenser in which the refrigerating water comes in direct contact with the steam and mingles with the water of condensation. See CONDENSER.

INJECTION-PIPE. A pipe that conducts the refrigerating water to the condenser of a steam-engine.

Injector. An instrument for supplying feed-water to steam-boilers, the action of which depends upon fluid friction or "induction," and the energy due to the latent heat of steam being transferred to a stream of water. In the simplest form of the instrument, a small jet or stream from the boiler is projected from a tube passing partly through a chamber, to which is attached the water-supply pipe, into a conical or bell-mouthed tube of larger dimensions, which passes into another chamber provided with an overflow, and terminates at the entrance of the discharge-pipe leading to the boiler. The discharge-pipe is provided with a check-valve, and the steam-jet and water-supply are adjusted by suitable mechanism. When started in operation, the steam-jet, by its friction or adhesion, exhausts the air or vapor, if any, from the supply-pipe and chamber, ejecting it through the overflow; the water fills the vacuum, and, passing through the annular space between the nozzle of the jet-pipe and the conical tube, comes in contact with the steam and condenses it; the energy due to the weight and high velocity of the steam is, after condensation, transmitted to a greater weight of water, the combination moving at a slower velocity, the heat extracted from the steam by condensation being the means of such transmission, enabling the stream to overcome a much greater resistance than that due to the pressure which supplies the steam-jet. The overflow permits the escape of any excess of steam or water resulting from lack of proper adjustment. The weight of water delivered relative to that of the steam consumed may be considered as a function of the difference between the temperature of the stream and the total heat of the steam. There are several designs of the instrument, their difference depending principally upon proportions and mechanism for adjustment; but none are considered reliable when hot feed-water is used.

Injuries to Cannon. The injuries from the powder generally occur in the rear of the projectile. They consist of enlargement of the bore; cavities produced by the melting of a portion of the metal by the heat generated by the combustion of the charge; cracks; and furrows or scoring produced by the erosive action of the gases.

The injuries from the projectile consist of an indentation at the seat of the projectile, and a corresponding burr in front of the projectile; enlargements formed by the balloting of the projectile in the bore and at the muzzle; scratches and cuts made by an imperfect projectile or by the fragments of broken ones; wearing away of the edges of the lands; and cracks on the exterior.

Ink-fish. The cuttle-fish (which see).

Inland Sea. A very large gulf surrounded by land, except at the communication with the ocean, as the Baltic, Red, and Mediterranean Seas.

Inland Trade. That which is wholly managed at home, and the term is in contradistinction to commerce.

Inlet. A term in some cases synonymous with *cove* and *creek*, in contradistinction to *outlet*, when speaking of the supply and discharge of lakes and broad waters, or an opening in the land forming a passage to any inclosed water.

Inman, William, Commodore U.S.N. Born in New York. Appointed midshipman from New York, January 1, 1812; served on the lakes during the war of 1812, afterward on the Atlantic.

Commissioned as lieutenant, April 1, 1818; served in the Mediterranean and on the Atlantic in 1823; commanded one of two boats capturing a pirate vessel mounting 3 guns, on the coast of Cuba; from 1834–37 served as executive-lieutenant of a flag-ship frigate in the Pacific.

Commissioned as commander, May, 1838; commanded steamer "Michigan," on the lakes, 1844–46.

Commissioned as captain, June 2, 1850; commanded steam-frigate "Susquehanna," 1851; from 1859–61, commanded the African Squadron which recaptured and landed in Liberia 3600 slaves. Retired December 21, 1861.

Commissioned as commodore, March 12, 1867. Died, 1872.

Inner Post. Worked on the inside of the main post running down to the throat of the stern-post knee.

Inquiry, Court of. A court of inquiry is held by the same authority as a general court-martial; that is, may be ordered by the President, the Secretary of the Navy, or the commander of a fleet or squadron without restriction as to "express authority."

Their origin is not found in law, but in the exercise of kingly prerogative. Custom grafted them into the military judicature of England, and the United States did not provide for them by statute (although they were probably held earlier) until April 23, 1800. It is gratifying to say that the laws relating to their organization and powers have not undergone the slightest change since then. Their object is to ascertain facts in complicated or difficult cases for the information of superior authority. They may be convened to establish responsibility, or criminality, as a preliminary proceeding to trial by court-martial, or to clear up matters of public welfare; or to exculpate individuals believing themselves aggrieved. In any case, they record, sift, and methodize the information obtained, and upon their report is determined whether or not further action is necessary or expedient.

The functions of courts of inquiry are therefore semi-judicial, and their proceedings are marked by great precision, though, as regards documentary evidence, the same strictness does not prevail as in courts-martial. Their duties depend almost entirely upon their instructions, which should be minute and definite, and the procedure is that of courts-martial so far as applicable. Being assimilated to, and held in many respects in the light of a grand jury, its members are, as a rule, disqualified to sit as "judge and juror" in the court-martial which may follow. Whether they give the facts of the case only, or an opinion, they are held to have been exposed to impressions which might operate against a fair trial of the accused.

"A court of inquiry shall consist of not more than three commissioned officers as members, and a judge-advocate, or person officiating as such." (Rev. Stat., Sec. 1624.) They have power to summon witnesses, administer oaths, and punish contempts in the same manner as courts-martial, but they shall only state facts, and shall not give their opinion unless expressly required so to do in the order for convening.

In all investigations, the party whose conduct is the subject of inquiry and his counsel have the right to be present, to challenge members, to address the court, and cross-examine all of the witnesses. His presence is not obligatory, but is customary and advisable. He is usually called before the court; also the complainant (if there be one), before the subject to be investigated is announced. The judge-advocate administers to the members the oath, or affirmation, "well and truly to examine and inquire" into the matter before them (see Oaths), after which the president swears the judge-advocate to keep "a true record," etc. It will be observed that this order of administering the oaths is exactly the reverse of that prescribed by law for general courts-martial, and that for general courts is the reverse of that for summary courts, and that for an army general court is the reverse of that for a navy general court; and yet any departure from the order laid down in either case would, of course, be illegal.

These courts hold open sessions unless there be good reason to the contrary, which they decide when not anticipated by the convening authority. There is no statute of limitations for them. Two very notable and illustrative courts recently assembled in the State of New York (1878–80) upon the personal applications of Fitz-John Porter and Lieut.-Col. G. K. Warren, U.S.A., who were major-generals of United States Volunteers during the Rebellion of 1861–65, to examine into and review their military conduct at that time. Civil and military witnesses of all ranks, many of whom had served in the opposing army, were summoned from all parts of the country, and subjected to crucial examinations.

When a court is ordered to report *facts*, it does not mean the testimony simply, "but the result and conclusion of the court from hearing the evidence." An *opinion* is held by the Navy Department to be different from a "conclusion," and to relate to the merits of the case. The proceedings of a court are authenticated by the signatures of the president and judge-advocate, and "in all cases not capital, nor extending to the dismissal of a commissioned or warrant-officer," may be evidence before a court-martial, provided oral testimony cannot be obtained.

Courts of inquiry cannot award punishment, and are dissolved by the authority which ordered them to convene. "A commanding officer acting singly" has no power to order a court of inquiry, but can order a board of three officers to investigate any casualty, occurrence, or transaction in regard to which the government should be informed. Commanders of squadrons are required to order courts of inquiry promptly whenever called for, and transmit proceedings without delay to the Secretary of the Navy.—*Henry C. Cochrane, Captain U.S.M.C.*

Inshore. Toward the shore; nearer the shore.

Inspection. Solving a problem by inspection is the obtaining the result at once by looking into a table, the arguments of which are the data of the problem. Though few problems can be wholly solved in this manner, still the method is used in the different steps and portions of nearly every problem in navigation.

Inspection, Board of. A board was convened for the first time in our navy in 1870, at the instance and under the direction of Admiral Porter. Its purpose is to inspect all vessels of war going on, or returning from, a cruise, and it was at first composed of three line-officers of rank and experience. At present its composition is 1 commodore, 2 captains, 1 medical and 1 pay inspector, 1 chief engineer, 1 captain of marines, and a recorder.

When visiting a vessel the board is received with the honors due its senior officer.

The first step in the inspection is the assembling of the officers and crew at quarters, every part of the ship being thrown open. Her decks, holds, store-rooms, engine- and fire-rooms, magazines and shell-rooms, and every part of the vessel, with her various fitments, are closely scrutinized. She is then "cleared for action," and the battery provided in accordance with the

ordnance instructions. The officers in charge of divisions and departments report their readiness for battle to the executive-officer, who in turn reports to the commander,—the guns and implements for serving them are carefully inspected.

The board then directs the exercises, consisting of loading and firing; fighting one and both sides at the same time. The assembling of boarders, riflemen, and pikemen; of boarding and repelling the enemy. Injuries to gun-carriages, their tackling or implements, provided for. One or more guns are shifted from one carriage, port, or side to the other. Spars and rigging supposed to be shot away or wounded replaced or repaired. Shot-holes and leaks stopped. Fire incident to battle extinguished. Torpedoes fitted and exploded. The supply and character of powder charges and projectiles examined. The use of small-arms and Gatling-guns by marines and seamen, and other expedients for purposes offensive and defensive.

The boats are then armed and equipped for "distant service," with their respective details, and are exercised under sail and oars in the various evolutions of fleet movements of attack and landing,—in the latter case the crews are organized to form a battalion, with a battery of howitzers or Gatling-guns.

The spar and sail exercises are then had, consisting of sending down and up light masts and yards, of making and reducing sail, reefing topsails and courses, and shifting the same by unbending one set and bending another. The extinguishing of fire when not engaged in battle closes the exercises.

The watch-, quarter-, and station-bills, quality of clothing and provisions for the crew, are closely inspected, as well the engines, boilers, and their appurtenances, and whatever may tend to affect the health of the crew.

Some of the above exercises are dispensed with in ships newly commissioned.

The results of the inspection are reported in duplicate to the admiral of the navy by the senior officer. The admiral forwards a copy to the Navy Department with such recommendations as may to him seem advisable.

It is obvious that it being known to the navy-yard authorities where a ship is fitted out, and to the officers and men attached to a vessel that such an inspection is inevitable, stimulates them to do their utmost to render her efficient.—*J. H. Upshur*, *Commodore U.S.N.*

Instance Court (*Eng.*). A department of the admiralty court, governed by the civil laws of Oleron, and the customs of the admiralty, modified by statute law.

Insulated Wire. A wire suspended by insulators, as the ordinary telegraph-wire. Wire covered with some insulating material, as gutta-percha, Hooper's material, etc. See CABLE, ELECTRICAL.

Insulator. A substance of relatively small conductivity. See ELECTRICITY.

Insult. In a military sense, to attack boldly and in open day, without going through the slow operations of trenches, working by mines and saps, or having recourse to those usual forms of war, by advancing gradually towards the object in view. An enemy is said to insult a coast when he suddenly appears upon it and debarks with an immediate purpose to attack.

Insurance. See MARINE INSURANCE.

Insured. The party who obtains the policy and pays the premium.

Insurer. The party taking the risk of a policy. See UNDERWRITERS.

Intercalary Day. See DAY, INTERCALARY.

Intermediate-shaft. The shaft crossing the frame of a marine engine between the two engines and connecting the two paddle-shafts, sometimes applied to counter-shafts.

Internal Contact. This, in a transit of Mercury or Venus across the solar disk, occurs when the planet is just within the sun's margin.

Internal Planking. This is termed the *ceiling* of the ship.

Internal Safety-valve. A valve on a boiler opening inward by excess of external pressure to prevent collapsing in case the internal pressure of steam becomes reduced by condensation much below the pressure of the atmosphere. Called also *reverse valve* and *vacuum valve.*

International Law. 1. *Sources, authority, sanction.*—International law is a collection of rules governing the intercourse of civilized states. The rules are derived partly from general principles of right and justice, and partly from considerations of general convenience. The safest method of determining them is by induction from the widest and most lasting usage. Usages vary considerably at different periods, and in the practice of different states, but no usage is likely to be lasting which is opposed either to justice or the general convenience. In cases of conflicting usage, the preference must be given to that which accords most nearly with these two final tests. This process does not always bring about a uniform result, because there is no single authority to pronounce finally upon the validity of any given rule, and individual views of justice and of the general good are apt to be clouded by considerations of individual interest. But in the present state of international relations it affords the nearest method of approach to a universal public law. There is no international legislature to formulate the law, no common judiciary to interpret it, and no executive to enforce it. Hence it is somewhat variable and shifting, both in principle and practice. Its authority is derived from the general consent of nations, tacit or express. Its doctrines are laid down with more or less variety in the works of text-writers, in state papers, in the decisions of courts, and occasionally in statutes and treaties, though the last more frequently embody exceptions to the law than rules of the law. It is enforced by the governments of independent states acting separately or by their agents. Of sanctions, in the sense of a penalty attached to the law for its violation, international law knows little. Acts in violation of international law, committed by individuals, are punished by the government having jurisdiction over the offender, if its laws take cognizance of the offense; and, in some cases, as breaches of blockade, or carrying contraband, by a judicial confiscation by courts of the injured state. But in the first case it is a breach of municipal, not of international, law that is punished, and in the second the penalty is inflicted by a tribunal whose authority is derived wholly from the injured state. Where governments or the states they represent are the offenders, there are no sanctions except public opinion and war; the first of which can be called a sanction only

by a figure of speech, and the second is one that benefits only the stronger party. War is a penalty that cannot be successfully imposed by a weak state upon a powerful one, where the latter has violated its international duties. The same is true, though to a less extent, of reprisals.

In determining the rules of international law, the greatest reliance is to be placed upon state papers and decisions of courts, as embodying principles adopted to meet actual cases and carried out in actual practice. In the former, however, allowance must be made for the interested leanings of statesmen who are advocating a cause, rather than judging impartially both sides of a question. Even in the decisions of courts, a certain partiality for national views of public policy is almost unavoidable. Treatises are valuable guides, but, as their authors are under no responsibility, they may give way to speculative tendencies, and they often fail to distinguish between the law as it actually is and their views of what it ought to be. Even here it is necessary to know the nationality of the writer, for each nation has its own school of publicists, who view the law largely from an interested stand-point. The principal authorities are Halleck, Kent, Wheaton, and Woolsey in the United States, Phillimore, Twiss, Ward, and Manning in England, Heffter in Germany, and Ortolan and Hautefeuille in France, though the last advocates a theory of international law which is far from receiving general support. The best modern treatise is that of Calvo, a South American, published in French and Spanish. Treaties sometimes contain statements or definitions of rules of international law, but they are only binding upon the parties to the treaty. Treaties in which a large number of states have united in the adoption of a rule, as in the Declaration of Paris of 1856, sometimes go far towards fixing or modifying a hitherto unsettled doctrine.

2. *States and their attributes.*—As international law governs the intercourse of states, it is upon states as units, rather than upon individuals, that the law primarily operates. But it also concerns closely certain officers as agents of states, and citizens who are brought into relation with governments other than their own. A state is a collection of persons united by a political organization, occupying a fixed territory, and subject in its relations to other political bodies to no recognized control or authority outside of its own organization. The supreme control which a state, through its government, exercises over all its concerns is called sovereignty. This attribute of states is a thing independent of forms of government. It resides in the body or bodies to which the state by its constitution or organic law has deputed the powers of government, and which are designated collectively as *the sovereign.* The sovereign may be an individual, as in an absolute monarchy, or it may be an assemblage of individuals or bodies of varying complexity and organization, as in most modern states. There are two kinds of sovereignty,—internal sovereignty, which concerns the interior administration of a state, and external sovereignty, which concerns its foreign relations. From one or the other all the particular powers of government are derived; but it is with the second alone that the system of international law has to do. In a newly-established state the acknowledgment of its independence by other states, or *recognition*, as it is called, is necessary to the full exercise of external sovereignty. The question of according this recognition in doubtful cases is a question of policy rather than of law; but when the new state gives sufficient assurance of permanence, recognition generally follows as a matter of course. In a civil war, when two parties are contending for power, the question arises which of the two parties shall be recognized by foreign states when each claims to be exercising the powers of government. Here again the question is largely one of policy, as long as the issue is doubtful, but it is the general practice for foreign states to recognize, in the end, the government *de facto* without inquiring into the justice of its foundation.

For certain limited and temporary purposes, a government may sometimes be recognized without the recognition of the state which it represents. This case only arises when a civil war or insurrection has assumed extensive proportions, and it becomes necessary to maintain relations with the insurgents analogous to those between state and state. Such a limited and partial recognition is known as "recognition of belligerency," and it only lasts during the continuance of the civil war or insurrection. It exists only for war purposes, and its effect is to place both parties to the contest on the footing of belligerents, with all the rights and duties towards each other and towards neutrals that result from such a condition.

From the possession of sovereignty flow the three primary rights of states. These are the rights of self-preservation, of independence, and of equality. The right of self-preservation is the right of every state to take hostile measures to protect itself from foreign aggression. The right of independence is the right of a state to manage its own concerns without interference or dictation from without. The right of equality is that by which all states are equal before the law; that is, equally subject to the operation of its rules, apart from their size, power, or importance. By it the obligations of a powerful state to a weak state are the same, under the law, as those between states equal in power. From these three primary and permanent rights all the specific rights of states are derived,—the right of making war and peace, of negotiation, of legislative and judicial control of foreigners within the territory, and, in fact, all the rights conceded to sovereign states by the law.

Though states are not moral persons, in the strict sense that all the principles of ethics apply to them in the same way as to individuals, yet there are certain duties or moral claims, as they have been well called, which lie at the basis of the system governing their relations. Of these, four well-defined classes may be mentioned as receiving general acceptance. These are the duties of humanity, of good faith, of comity or international civility, and of respecting the unquestioned rights of another state, and repairing injuries. Other obligations, more or less vague in character and extent, have been referred to by different political moralists; but it is eminently unsafe to reason in international law from individual views of international morality; and the four obligations mentioned are all that can reasonably be assumed as universally binding.

States are sometimes joined with other states in a formal union, by which each parts more or less with its sovereignty. These unions vary in character, and may be divided into three general classes, viz.: Unions under a reigning prince, federal unions, and protective unions. In the first class are: (1) Personal union, which exists when two states have a reigning prince in common, but are otherwise entirely independent. An example of this is the union of Holland and Luxemburg, the king of Holland being also grand duke of Luxemburg, but each state retaining its individuality and full powers of sovereignty. (2) Real union, where internal sovereignty is reserved to the members, but external sovereignty is given up to the union as a whole. The states of the Austro-Hungarian monarchy are an example. (3) Incorporate union, where both internal and external sovereignty reside in the body politic as a whole. The union of Great Britain and Ireland is an example. Federal unions are of two kinds, a federal state, such as the United States of America, where external sovereignty resides in the union, and a confederation of states, where it is reserved to the members, as in the German Confederation of 1815. Protective unions exist in great variety, but they are all based on the surrender of some part of the power of independent action in foreign affairs to the protecting state. The dependencies are generally known as semi-sovereign states.

3. *Diplomatic and other agents.*—Diplomatic agents are of four classes: ambassadors, ministers plenipotentiary, ministers resident, and chargés d'affaires. The United States are represented by agents only of the last three classes. In order that these agents may be perfectly free and unrestricted in the performance of their duties they are granted a general immunity from the legal jurisdiction of the government to which they are accredited. The immunity extends to their family and suite, and, within limits that have never been clearly defined, to their residence. The immunity consists in exemption from arrest, from civil or criminal process, and from being required to attend as a witness in court. The property of the minister is also exempt from all proceedings *in rem*. As to the immunity of the official residence, the better opinion is that no judicial process can be served therein, though some governments—the British, for example—claim the right to enter and make arrests, after giving notice. The only general exception to diplomatic immunity is where the acts of a minister endanger the safety of the state, as by inciting to insurrection, and where the emergency admits of no delay. Here the paramount right of self-preservation justifies a disregard of the diplomatic privilege. But in all cases but those requiring instant action the government to which the minister is accredited must proceed by demanding his recall.

Consuls.—Consuls are commercial agents, having, in general, no diplomatic functions or diplomatic immunities. A state is not bound to allow the residence of foreign consuls, though, at present, the practice is universal among civilized states. Consuls cannot enter upon their duties until they have received an exequatur, or permission to act, from the local government. If guilty of offenses against the law, they may be tried in the courts of the country where they reside, or they may have their exequatur withdrawn, and be sent back to their own country. The duties of consuls of the United States consist in receiving the protests of masters and seamen; in administering the estates of Americans dying abroad intestate; securing the effects of stranded vessels; sending home destitute seamen, etc. In the East and in the Mohammedan countries of the Mediterranean they have judicial functions, which are defined in the treaties between the United States and those states, and they are granted immunity from the operation of the local law, similar to that accorded to diplomatic agents.

Naval commanders.—The commanders of ships of war, at sea and on foreign stations, are in a sense agents of the government, and as such must come directly under the operation of international law. While on shore in foreign countries they have no immunity from local jurisdiction, unless clothed with the diplomatic character, by virtue of special instructions. Among their duties as agents of the government are, in time of war, the examination of the merchant vessels of all countries, and the capture of those found violating the laws of war; in time of peace, the police of the ocean, which requires them to apprehend pirates, and the protection of American interests wherever such protection demands their interference. It must be remembered, however, that a forcible demonstration of any kind is a hostile act, which, if unwarranted, violates the sovereignty of the state against which it is directed, and interrupts, as far as the act is concerned, the peaceful relations of the government. The injured state is likely to demand reparation, and if a blunder has been committed by a naval commander, the government will be compelled to sacrifice him, even though he may have supposed that he was acting in the discharge of his duty. If such acts are performed at the request of a consul, the officer's individual responsibility will not thereby be taken away. Though it is the duty of a naval commander to render every reasonable assistance to a consul, yet the consul cannot give him orders, nor can the officer throw the responsibility for his acts upon the consul. He must, therefore, be sure that he keeps within the bounds imposed by international law.

4. *Nationality.*—(a) *Persons.* As international law is concerned (1) with states, and (2) with the agents of states, it also affects (3) individuals, as the members of a state, whenever they come into relations with any other government than their own. It is, therefore, of great importance to determine exactly the tests by which membership of a state, or nationality, as it is called, is known. A person who has always resided in the country of his birth, and whose parents were natives of the country, clearly belongs to that country. But if he removes to another country, or if he engages in a business which is partially conducted in foreign territory, he enters upon new relations. While residing abroad, he may retain his allegiance to his native country, or he may transfer it. In the first case he obtains a new domicile, in the second, a new citizenship; in other words, he becomes naturalized. A man's domicile is the place in which he resides with the intention of remaining. If a man goes to a country, *sine animo revertendi*, or with only the general intention of returning

after many years, he acquires a domicile there. If he has been there only a short time, the presumption is that he has not acquired a domicile; but this presumption may be removed by proof of intention to remain. If he goes to a country only temporarily, with the intention of returning shortly, he does not acquire domicile. If he has a house of trade in a foreign country, though retaining his original residence, he is considered as domiciled there, so far as the trade of his foreign house is concerned. Short absences do not destroy domicile; but, in the case of a long absence, the presumption is that the domicile is changed, especially if the person has returned to his native country. A man simply domiciled in a foreign country retains his original allegiance. If he wishes to change this, he must go through the process of naturalization. The laws governing naturalization differ in different countries, but they agree in requiring a certain period of residence, a formal renunciation of former allegiance, and a formal adoption of the new allegiance. Naturalized citizens are regarded in the same light as natives by international law, except that on their return to their native country they may be made accountable for any obligations to the state which they had incurred, but had not fulfilled, before the change of allegiance.

(b) *Ships.* Ships, as well as persons, must have a distinct nationality, and certain rights and duties result from it. The conditions upon which nationality is acquired are determined by each state in its municipal law. Laws determining the national character of ships are known as navigation laws. They vary in detail in different countries, but they agree in looking to three main facts: (1) place of construction of the ship, (2) ownership, and (3) nationality of officers and crew. In regard to (1), most of the states of Europe and America admit foreign-built vessels to their registry. The exceptions are the United States, Brazil, Portugal, Greece, Mexico, and Colombia, which require that a vessel should be native-built. As to (2), in most countries merchant ships, in order to obtain a register, must be wholly owned by subjects. In Belgium and Holland, however, three-eighths of a ship may be owned by foreigners; in France and Greece, one-half, while in Italy, Sweden, and Chili ships may be owned by domiciled residents. As to (3), nationality of officers and crew, England, Belgium, Norway, Germany, Holland, Chili, and Uruguay make no limitation; Austria and Mexico require that the captain and two-thirds of the crew shall be subjects; Brazil and Portugal, the captain and three-fourths of the crew; Peru, the captain and one-fifth of the crew; Denmark, all the officers and crew; Sweden, only the captain; Russia, one-fourth of the crew; the United States, Spain, and Italy, the officers and two-thirds of the crew; France and Greece, the officers and three-fourths of the crew. Evidence of the nationality of a vessel is to be found in her flag and papers. The flag alone is not conclusive evidence, and in time of war the question can never be decided without reference to the papers. Ships' papers relate to the nationality of the vessel, the course of the voyage, and the cargo. The most important are: 1. Register or certificate of nationality, sometimes replaced or accompanied by 2. Passport, issued by the sovereign authority, or 3. Sea-letter, issued by local authorities where the ship was fitted out. 4. Charter-party, or contract by which the vessel is let to hire. 5. Log-book, or daily record of the voyage. 6. Bill of sale (when the ship has been sold). 7. Bills of lading, or duplicate receipts of cargo from master to shipper. 8. Invoices, detailed statements of separate lots of goods. 9. Manifest, a general statement of the cargo. 10. Clearance, a permission to sail, given by local authorities of port from which the vessel sets out. 11. Muster-roll, statement of crew. 12. Shipping articles, agreement for the hiring of seamen. 13. Bill of health.

5. *Rights of navigation.*—The high seas are open to the free navigation of ships of all nations. No state can exercise sovereignty or jurisdiction thereon, except on board of its own vessels, public or private. These the municipal law follows, as long as they are at sea; and offenses committed on board of them at sea are cognizable only by the courts of the country to which the ship belongs. No visit, search, or detention of merchant vessels by men-of-war can be exercised, except in time of war, when the usage of nations makes an exception in favor of the belligerent right of search. Another exception is in the case of vessels suspected of piracy; but, in general, no act of sovereignty can be exercised by the agents of any state on the high seas, except on board of its own vessels.

The territorial waters of a state include the open sea to a distance of 3 miles from the coast, and all rivers, lakes, inland seas, harbors, and roadsteads, and bays included between neighboring headlands. Within these limits foreign vessels must conform to the local laws and regulations. They may even be refused an entrance, if the government exercising sovereignty sees fit to close its ports to foreign commerce. States within whose borders lie rivers or straits, by which alone access from without can be obtained to another state, cannot deny to the other state the right to use these means of access. They may, however, subject vessels passing through their waters to reasonable tolls and regulations.

6. *Local jurisdiction over foreign ships in territorial waters.*—A distinction must here be drawn between public and private ships. Public ships are those employed in the service of the state, commanded by naval officers, acting under a commission from the government. The ship may not be owned by the government, it may carry no guns, it may have a cargo on board; but it will still be a public ship if it answers the conditions named. Public ships carry no papers, in the sense in which merchantmen carry them; but if the flag and pennant do not sufficiently establish their nationality and their public character, the captain's commission and orders are always conclusive. In foreign ports public ships have peculiar immunities. The state to which the port belongs has no authority on board, can exercise no police functions, and can serve no judicial process. Offenses committed on board the ship, by which the local laws are violated, are not cognizable by the local courts. But if an offense is committed on shipboard by an inhabitant of the place, and the commander of the ship sees fit—as he always would—to deliver him up to the local authorities, they can try the offense. But they could not arrest the offender on board the foreign ship of war. To private or

merchant vessels no such immunity is granted. They have no exemption from the jurisdiction of the state in which they are, except by express convention. Police-officers may go on board of such vessels, their officers or seamen may be arrested on board, writs may be served, and crimes occurring on board, by whomsoever committed, are triable in the local courts. The law of France differs from the general practice in this, that it allows much greater privileges to foreign merchantmen than that of other states. According to the French rule, acts relating to the interior discipline of the ship, and crimes to which the crew alone are parties, whereby the peace of the port is not disturbed, are left entirely to the authorities of the ship; but crimes committed on board the ship by subjects of the state where the vessel lies, or against subjects, or any offenses by which the peace of the port is disturbed, or in relation to which the assistance of the authorities is invoked, are tried in the local courts. This rule is confined to France alone, and must be considered as a waiver on the part of the French government of rights conceded by the law of nations. In all cases of offenses committed on shore by the officers or crews of foreign vessels, public or private, the offender may be arrested on shore, and tried and punished by the local courts. But if the offender belongs to a ship of war, and escapes to his ship, the law cannot follow him there, nor can it compel the commander of the ship to surrender him.

7. *Refugees and deserters.*—(a) *From the shore to the ship.* The captains of ships of war and the masters of merchantmen have the right to refuse asylum to fugitives; and they ought always to refuse it to persons under accusation or sentence of crimes, generally known as such. Persons charged with light offenses, or with offenses that are only crimes by the local law (as in Mohammedan countries), or with political offenses, may be received; but all these cases call for the exercise of great judgment. In a civil war or revolution, care must be taken to give no assistance to either party; as, by the transportation of an insurgent chief from point to point. In ships of war especially, the commander must do nothing that will compromise his government. The general rule is that the captain may receive such persons, or may refuse to receive them, or, after receiving them, may put them off, being guided always, first, by the paramount necessities of the service, and, secondly, by such humane consideration as the fugitive may deserve. Fellow-subjects demanding an asylum should always be received, unless there are grave reasons for refusal. The rights of the local government are in accordance with the rules governing local jurisdiction, already given. Neither search nor arrest can be made on board a public vessel; but in merchant ships the local courts have full powers, and the master may even be prosecuted for harboring fugitives.

(b) *From the ship to the shore.* If the fugitives are prisoners of war escaping from a belligerent cruiser, they become free immediately upon landing in neutral territory, and no claim for their recovery or surrender will be entertained. Fugitives belonging to the ship, or deserters, may be reclaimed of the local authorities. The universal usage is for the consul to furnish information, or if there is no consul, the captain or master of the ship, and the authorities thereupon give such assistance as they see fit. There is great difference in the ease with which deserters are recovered in different countries and in the assistance that the local government and police are willing to render. The policy of the United States has generally been to insert a clause in consular treaties by which consuls of both contracting parties are authorized to arrest deserters from ships of war and merchant vessels of their country, and to require the aid of the local authorities. There are 22 such conventions between the United States and foreign powers, but Great Britain is not included in the list.

8. *Piracy.*—Piracy is robbery or murder on the high seas, done *animo furandi*, and in a spirit of general hostility. Pirates are considered as having no nationality, and the crime is one against the whole human race. They may be seized by any one, and tried in the courts of any state. It is the duty of naval commanders to apprehend them wherever they may be, or against whomsoever the crime has been committed; provided always, that the sovereignty of another state is not violated by hostile acts committed therein. Vessels suspected of a piratical character may even be searched in time of peace by the cruisers of any state; but if the vessels so searched should be found to be innocent, the government whose cruiser makes the search will be responsible to the state to which the searched vessel belongs. Search should therefore only be made upon strong suspicion. Acts have sometimes been made piracy by the municipal law of a particular state which are not piracy by international law. These cases are purely national in their character, and concern only subjects of the state making the law. Persons guilty of acts which are made piracy by municipal law can only be seized by cruisers of their own state, and can only be tried in their own courts.

Laws of War.

9. *Hostile measures falling short of actual war.*—It often happens that a state or its agents may find it necessary to redress injuries or repel aggressions that are hardly considerable enough to be a *casus belli.* In these cases the right of self-preservation justifies the use of such measures as may secure the safety of the state without going to war. Every effort must first have been made to obtain redress by peaceful means; but if this is refused, or if the emergency is such as to leave no time for appeal to higher authorities, resort must be had to force. In the first case, forcible measures can only be ordered by the sovereign authority; in the second, action must be taken by the agent of the government on the spot. Hostile acts on the part of the sovereign authority may take the form of embargo, retorsion, or reprisals. *A civil embargo* is laid by the state upon its ports in the form of a prohibition to merchant vessels of one or more foreign states from entering the ports. *A hostile embargo* is a detention of foreign merchant vessels. If a hostile embargo develops into a war, the vessels detained may be regarded as prize. *Retorsion* is simply retaliation, and consists in redressing an injury by the infliction of a like injury. *Reprisals* consist in the seizure of property belonging to the offending state or to its subjects. It was effectively used by the

United States against France in 1798. To these three forms of hostility may be added pacific blockade, which has been attempted several times, but which is open to many objections and has never received general support, and the performance of treaty guarantees, under which we have occasionally landed forces at Panama. The last is of an anomalous character, and only arises in the cases provided by treaty.

Forcible measures are taken by the commander of a military or naval force on the spot only when the emergency admits of no delay. Such cases frequently arise in barbarous or semi-civilized countries when outrages have been committed against citizens of the state to which the force belongs, and in revolutionary countries when the lives and property of foreigners are in danger. Cases may even arise in civilized countries where an immediate application of force is necessary. The latter are the most delicate cases that can arise in the conduct of international relations. They are so various and unforeseen in character as to admit of no general rules, and they must be determined by the special circumstances of each case as it arises. A commander must fulfill the duty of protecting the citizens of the state on the one hand, and the obligation to respect the rights of a foreign and friendly state on the other. Further than this it is impossible to prescribe rules, and merely to mention the cases that have occurred would exceed the limits of this article.

10. *War and its prosecution.*—The question whether a war is just or unjust is one which hardly enters into international law, though it is generally discussed in treatises on the subject. A nation has received injuries that cannot be redressed, or to which redress is refused, and declares war against the offender. The injured state is alone the judge of the extent and gravity of its wrongs, and it goes to war because war is the only remedy left to it. There is nothing to prevent it from going to war on a frivolous pretext, or for purely aggressive reasons; third parties will not interfere by force unless their own safety is threatened. Modern practice varies in regard to declarations of war; but it is always desirable that a formal declaration should be made, in order that both subjects and neutrals may be sufficiently apprised of the new state of affairs. If hostilities break out gradually, a subsequent declaration legalizes all hostile acts that have preceded it. The outbreak of war puts a stop to all trade and other intercourse between subjects of opposing belligerents. Contracts made with an enemy before the war are postponed; those made during war are void. Partnerships entered into before the war are dissolved. A government may make exceptions to the general stoppage of trade, but licenses are only respected by agents of the government granting them. The grant of a license is a high act of sovereignty, and can only be made by the supreme authority in a state. The license of an admiral, commander-in-chief on a station, binds only those under his orders. The possession of an enemy's license is enough to condemn a ship. At the beginning of a war, enemies in the country are generally given a reasonable time to withdraw with their effects. The general rule with regard to enemies' private property during war is that it is liable to capture at sea, but not on land. The distinction is based on the fact that one of the speediest and most humane methods of bringing an enemy to terms is by crippling his commerce; while capture of property on land serves no such purpose, and is attended with the greatest hardship to individuals. Property is not wholly exempt from capture, even on land; an invading army is always justified in obtaining supplies, on requisition, either with or without payment, and, in general, in living upon the enemy. But there is no such general right of confiscation as at sea. The laws of war have been improved considerably in recent years, and they are better defined than formerly. The Geneva conventions of 1864 and 1868, for securing immunity to the medical service and the wounded, the Brussels conference of 1874, and the St. Petersburg treaty of 1868, prohibiting the use of explosive bullets for small-arms, are steps in this direction, though the second of these failed to come to an understanding. As to persons, the general rule is that non-combatants shall be unmolested; but severe penalties are inflicted upon those who take up arms against an invading force without being distinctly soldiers, and belonging to an authorized organization. This would include guerrillas and partisan bands whose officers held no commission from the government, and who bore no distinguishing badge or uniform. An exception is made, however, in the case of a *levée en masse.* The practice of private war on the ocean, or privateering, seems to be falling into disuse. Privateers are private persons to whom a commission, called a letter of marque, is issued by the government, allowing them to cruise for the purpose of destroying an enemy's commerce. They are placed under heavy bonds to observe the laws of war and to send in their prizes; but the practice is open to many objections, as it is difficult to maintain the necessary supervision and restraint over their movements. The Congress of Paris in 1856 abolished privateering as between the contracting powers; and though the United States, and some smaller powers, have not acceded to it, yet the Declaration has gone far to discourage the practice. War should be carried on as humanely as possible consistently with the end in view, which is to break the power of the enemy. The bombardment and destruction of unprotected cities is contrary to civilized practice; but a city defended by forts may be bombarded, as a means of reducing the forts. Good faith is to be kept even with enemies, but ruses and stratagems of war are permitted. False colors may be carried to deceive an enemy; a ship may even chase, though she may never fire, under false colors. Surrender is indicated by hauling down the flag, or by a white flag, which puts a stop to fighting at once; but a vessel that undertakes to escape, or to renew the fight, after the cessation of hostilities caused by hauling down the flag, may be severely dealt with. When a seaport surrenders to the army or navy it may be occupied, and regulations established for its government during the occupation; and the commander-in-chief of the forces of occupation may prescribe a tariff for foreign vessels and goods, and levy duties accordingly.

11. *Search, detention, and capture.*—The right of search is the right to stop and examine merchant vessels in time of war to ascertain their

nationality and character, and the nature of their cargo and of their voyage. It can only be exercised by ships of war, and only upon merchant vessels. It may be exercised anywhere except within the territorial waters of a neutral state. The usual mode of conducting a search is by sending a junior officer on board the vessel to be searched, who inspects the ship's papers, interrogates the master, officers, and crew, and, if necessary, examines in detail the cargo and all parts of the ship. The ship of war is not to use force, unless the merchantman willfully evades or resists search. If, upon examination, the vessel is clearly neutral property, and if she is engaged in innocent trade, she is allowed to proceed on her voyage; otherwise she will be detained. The circumstances, any one of which will justify detention, are as follows: that the ship is enemy's property; that she has undergone a fictitious and fraudulent transfer from an enemy owner; that her papers are false, missing, or mutilated; that she is herself contraband, or is carrying contraband goods, persons, or dispatches; breach of blockade; sailing under enemy's convoy; sailing under enemy's license, and trading with the enemy, if the vessel belongs to a subject or to an ally; enemy's prize; recaptured or rescued prize. It is not necessary that the guilt of the vessel should be absolutely proved. If circumstances show a reasonable ground of suspicion, the captain of the cruiser is justified in detaining her. But if the vessel be detained without a reasonable ground of suspicion, the captor will be liable in costs and damages. If the circumstances warrant capture, the captor will put an officer as prize-master and a crew on board the vessel, who will take her to the most convenient port where a prize-court may be sitting for adjudication, with all her papers and cargo intact. Resistance to search will subject the vessel to capture and subsequent condemnation, though she may be innocent of any other offense. Vessels sailing under neutral convoy are not on that account exempt from search, and the resistance of the convoying ship to the search of any vessel under her escort will subject both the convoying and the convoyed ships to capture. All prizes must be sent in for adjudication, unless special circumstances, such as the want of men for a prize-crew, or the unseaworthiness of the prize, make it impossible. In this case, if the prize is clearly enemy's property, she will be destroyed, otherwise she must be released. If the prize is destroyed, her papers, and any part of her cargo that may be saved, must be sent to a prize-court. If, for any reason, the prize cannot be sent to a port of the captor, it may be sent to a neutral port, if the neutral authorities make no objection; and the cargo, if perishable, may be sold there after the proper survey; but the ship's papers, the most important witnesses, and the proceeds of all sales must be sent to a prize-court in charge of an officer, with a full statement and explanation of all proceedings in relation to the prize. The papers, proceeds, and witnesses will be delivered to the officers of the court, as well as the prize itself, if brought to the place where the court is sitting.

12. *Prize-courts.*—The court to which the prize is sent must be a prize-court of the captor, and it can only sit in the territory of the captor or of his ally. The prize-master, upon his arrival, should immediately cause proceedings for adjudication to be instituted by the proper officer. In the United States the district courts have cognizance of all cases of prize, and proceedings are instituted by the U. S. district attorney. The hearing of the case is rather in the nature of an inquiry by the government, rather than of litigation *inter partes.* The witnesses belonging to the prize are examined privately upon certain standing interrogatories. Upon this testimony, together with the evidence of the ship's papers, the decision of the court is based. The examination is called the examination *in præparatorio,*—*i.e.*, preparatory to judgment by the court. In ordinary cases, no further examination is held, and no testimony is taken in behalf of the captors. If, however, the preparatory examination leaves the case in doubt, the court may order further proof, in which any evidence may be received bearing upon the case. If the prize is condemned, the court orders a sale, and makes the distribution of the proceeds under the statute. If the prize is not enemy's property, and if no illegal act has been committed, the prize is restored to the claimants, if they have proved their title to the property. Damages may be awarded against the captor in case of detention without probable cause.

13. *Enemy's property and neutral property.*—Until the year 1856 it had been a general principle of prize law that ownership determined the national character of ship's cargoes, irrespective of the flag under which the ship might be. Enemy's property in a neutral vessel was liable to capture, but neutral property in an enemy's vessel was not. The Declaration of Paris reaffirmed the second of these rules, but reversed the first. By the new rule free ships made free goods; the neutral flag covered the enemy's cargo, and exempted it from seizure. Although the Declaration has not been universally adopted, the United States among other nations having refused to accede to it, it is not improbable that the rule, "free ships make free goods," may become general. As the law stands, however, apart from express conventions, vessels laden with enemy's property will be seized and sent in. They are not condemned, and they receive freight for the whole voyage, but no damages for detention. The enemy's cargo is confiscated. The other rule simply restores the neutral cargo taken out of an enemy's ship. Freight is paid to the captor if the goods are taken to their port of destination, otherwise not. The character of the property, that is, the question whether it is neutral or hostile, is determined by the domicile of the owner, independently of his nationality; property is neutral whose owner is domiciled in a neutral country, and property is hostile whose owner is domiciled in the enemy's country. But these rules are interpreted somewhat in the interest of captors. Thus, if a person has a neutral domicile, but a house of trade in the enemy's country, property connected with this house is deemed hostile; but if he has an enemy domicile, all his property is deemed hostile, wherever his house of trade may be. Ships sailing under the enemy's flag, wherever owned, have always a hostile character; and ships that have been transferred from an enemy owner to a neutral, after the war has begun, are regarded with peculiar suspicion. In determining questions of

domicile, territory in the military occupation of the enemy is regarded as hostile territory; and the produce of the soil of hostile territory is always regarded as enemy's property, no matter who may be the owner.

14. *Contraband.*—Contraband goods are goods useful for military operations and destined to the service of a belligerent. Two things are therefore necessary to constitute contraband,—1, warlike use; 2, hostile destination. The list of articles held to be contraband, when destined for the enemy's country, is not definitely settled. Goods may be divided into three classes, according to their employment,—(1) those useful primarily and chiefly in war, (2) those useful only for purposes unconnected with war, and (3) those useful alike in peace and in war, or sometimes in one and sometimes in the other. The first are always contraband, the second never; while the character of the third must be determined by circumstances. In the first class may be mentioned arms, ammunition, and projectiles, their appurtenances, and the materials and machinery for their manufacture; explosives; military equipments and clothing; military and naval stores, including spars, hemp, cordage, marine-engines, anchors, iron plates, and bars. In the third class are telegraphic materials, railway materials, coal, horses, money, and provisions. The last class are contraband when there is a presumption that they are intended for warlike use; as, when they are going to a fleet or to a port of military or naval outfit, or when the character of the war is such as to create a special demand for them. The immediate destination of the ship is not always held to be conclusive as to the destination of the contraband goods. The vessel may be bound for a neutral port; but if it can be shown that this is only a screen, and that the goods are ultimately destined for the enemy, she may be captured and condemned. The penalty in cases of contraband is the confiscation of the contraband goods, and of all other parts of the cargo belonging to the owner of the contraband goods. The ship is not confiscated unless she belongs to the owner of the contraband goods, or unless she sails with false papers; but in any case, no freight for the contraband goods, or damages for detention, are allowed to the ship. Liability begins when the ship carrying contraband has started, with an immediate or ulterior destination for an enemy's port. Liability ceases with the delivery of the contraband cargo; and the ship cannot be captured on her return voyage, unless she is shown to have made the outward voyage with simulated papers. A ship is contraband when she is fitted for war and destined for the enemy. If a contraband ship is captured she will be condemned, together with all contraband goods in her cargo, and all innocent goods belonging to the owner of the ship or of the contraband cargo.

15. *Carrying contraband persons and dispatches.*—Contraband persons are persons in the military or naval service of the enemy, and civil officers of the enemy sent out on public duty and at the public expense. Contraband dispatches are official dispatches of the enemy not in the ordinary mails and not diplomatic in character. Ships engaged in carrying such persons or dispatches are liable to seizure and condemnation, together with all their cargoes that belong to the owner of the vessel. The ships are looked upon as being for the time in the enemy's service. To establish their offense it is not necessary that they should be bound for an enemy's port, nor is it considered a justification that they are acting under constraint. Diplomatic persons and papers are not considered contraband. In all cases, vessels captured must be sent in for adjudication, and the obnoxious persons and dispatches must be sent in with them. Neither persons nor papers can be taken out of a neutral ship without capturing and sending in the prize.

16. *Blockade.*—Blockade is the stationing of a naval force near a port, river-mouth, or coast of the enemy, and the capture of all merchant vessels, neutral or otherwise, that attempt entrance or egress past the blockading force. Blockades, to be binding, must be effective; that is, maintained continuously by a force sufficient to make the passage dangerous. Paper blockades, or blockades established by proclamation, without stationing an adequate force near the blockaded port, are illegal. In order to justify the detention of a vessel attempting to enter or leave a blockaded port, it is necessary that the vessel should have had notice of the existence of the blockade. This notice may be actual or constructive. Actual notice is notice by the blockading squadron on its station. It is usually put in the form of a statement indorsed on the register of the merchant vessel by the boarding officer. Constructive notice is notice which may be presumed to have been given either by a proclamation or diplomatic circular of the blockading government, or by the notoriety of the fact. At the beginning of a blockade, a reasonable time may be allowed for the proclamation to become generally known; and during this time actual notice must be given. After the period has elapsed, it is no longer necessary, and the fact of notice may be constructively assumed. The only exception is in the blockade of remote places, ordered by the commander-in-chief on the spot, where diplomatic notice cannot be given; in this case, known as blockade *de facto*, actual notice or warning must be conceded during the whole period of the blockade, and neutral vessels may sail with a contingent destination to the blockaded port. But they are not allowed to anchor, or remain in the neighborhood of the entrance. The presence of the blockading squadron is considered sufficient notice to vessels lying in the blockaded port; but it is customary to allow neutral vessels a short time to leave the blockaded port in ballast, or with cargoes previously laden; but this privilege must have been expressly granted. The penalty for breach of blockade is confiscation of the ship and cargo. An unsuccessful attempt is regarded by the courts in the same light as a successful attempt, if the intention is proved. In attempts to break blockade inwards, where general notification has been given, liability begins when the vessel, whose destination is the blockaded port, has started on her voyage, knowing the port to be blockaded. In breach of the blockade outwards, liability continues till the end of the voyage, unless in the mean time the blockade has been raised; in which case the liability ceases. A blockade ceases when the blockading force voluntarily withdraws, or when it is driven off by a force of the enemy. In these cases, a new

blockade requires a new notification. But if the blockading squadron is only temporarily dispersed by stress of weather, and immediately resumes its station, the blockade is not held to have ceased. In strict law, neutral men-of-war have not the right to enter a blockaded port; but in practice, the privilege is usually conceded by the blockading squadron.

17. *Recapture and rescue.*—Recapture is the taking of a vessel which, at some previous time, had been captured by the enemy. Rescue is the recovery of a prize by the original crew, and is effected by overcoming the prize crew. Vessels which have been made prize by the enemy may be recaptured by cruisers of the other belligerent; but neutral ships of war cannot recapture prizes made by a belligerent, even though the prize was originally owned by subjects of the neutral state to which the cruiser belongs. A recaptured prize reverts to the original owner, if it has not yet been condemned in the enemy's prize-court, and salvage is awarded to the recaptor. The rule by which the prize returns to its original owner is called the right of postliminy. It can only take place before condemnation. If the prize has been condemned, the proceeds are distributed according to the provisions of the prize act, without regard to the previous owner's claims. If an enemy's vessel has been made prize, and is recaptured by the enemy, and again subsequently recaptured from the enemy, the proceeds go to the last captors. A rescued prize, on recapture from the rescuers, is always condemned, though it may not have been subject to condemnation before it was rescued. The mere act of rescue is considered as a resistance to the exercise of belligerent rights, like resistance to search, and it subjects all the property rescued to the extreme penalty.

18. *Rights and duties of neutrals.*—When a war breaks out between two states, other states may decide for themselves whether the occasion justifies or requires their joining in the war, or whether they will remain neutral. This is a question of policy, mixed with ethics, but it is in no sense a question of law. The policy of neutrality being once decided on, certain consequences flow from it. The belligerent must respect neutral rights, and the neutral must fulfill neutral obligations. Among the first rights of neutrals is that of having their territory free from the operations of the war. No hostile act can be performed within the borders of a neutral state, or within its territorial waters. Within these limits belligerent cruisers may not attack or capture vessels. The only exception is when a fight has been begun outside of neutral territory, and the enemy, during the fight, takes refuge within the limit. It is then said that the pressure of instant, overwhelming necessity may justify her capture. A belligerent may not, within neutral territory, increase his armament or military stores, recruit men, or employ force or stratagem to rescue prisoners or recover prizes from the enemy; nor may he make a neutral port the base of hostile operations. In case of the violation of neutral territory, the belligerent is bound to make reparation for his unlawful acts. Land forces may not march through neutral territory, but the rule is not so strict with regard to cruisers; and though a neutral may allow or forbid, as he chooses, the entry of belligerent cruisers into his ports, there is no restriction in regard to their passage within the three-mile limit along the open coast. On the other hand, neutrals have certain obligations towards the belligerents. Neutral governments are forbidden to send supplies of men, ships, arms, or money to either belligerent. It is their duty to prevent the forming of armed expeditions, and the building, equipment, or armament of ships of war for belligerent use; to exercise diligence in the detection and suppression of such attempts, and, if necessary, to pass laws for their prevention; but they are not responsible for supplies of arms, or other contraband, made by private citizens in the way of trade, nor for loans to belligerent governments made by private parties. It is their duty to prevent hostile acts between belligerents within their territory. They are responsible to the state which suffers by such acts, and they are called upon to demand reparation from the aggressor. If troops of either belligerent enter neutral territory the neutral must intern them,—*i.e.*, disarm them, and put them under either surveillance or parole. A neutral government regulates the entry into its ports of belligerent cruisers and their prizes, and the supply of coal to steamers, as seems best to it, but with the general limitation that all privileges granted to one party must be granted to the other.

19. *Treaties of peace.*—A treaty of peace is binding from the date of its ratification, but a prospective date is sometimes fixed for the treaty to take effect in distant parts of the world. Captures made after this date are unlawful, and must be restored; as is also true of captures made before the date, with knowledge that peace had been concluded. Other captures made previously to the treaty are retained, the treaty being understood to be upon the basis of present possession, unless otherwise stated.—*J. Russell Soley, Professor U.S.N.*

Interpolation. The finding a value of an element which falls between two given values. This process is called into constant requisition in navigation. The different elements tabulated in the Nautical Almanac are given for particular times at Greenwich, and to find their value at any instant between any two of these, a proportion must be worked. In most cases an approximation is sufficient, which may be found either by applying roughly a fractional part of their difference to one of them, or more accurately by the use of tables given in works on navigation. When extreme precision, however, is required, it must be remembered that these elements do not change uniformly, and a correction has to be applied which is called the *equation of second differences.*

Inundations. In ancient Egypt officers estimated the case of sufferers from the inundations of the Nile. The changes of property in Bengal by alluvion are equally attended to. *Inundation* is also a method of impeding the approach of an enemy, by damming up the course of a brook or river, so as to intercept the water and set the neighborhood afloat. In Egypt the plan was diametrically opposite, for by flooding Lake Mareotis the English gunboats were enabled greatly to annoy the French garrison at Alexandria.

Invalid (*Eng.*). A maimed or sick soldier or

sailor. To *invalid* is to cause to retire from active service from inability.

Inver. A Gaelic name, still retained in Scotland, for the mouth of a river.

Inverted-cylinder Steam-engine. One having its cylinder inverted over the shaft with direct action downward to the crank; much used in the mercantile marine on account of its economy of space, but objectionable for naval purposes, as the cylinders being high are exposed to the enemy's fire. Called also *inverted engine.*

Invincible Armada. See ARMADA, INVINCIBLE.

Invoice. An account from a merchant to his factor, containing the particulars and prices of each parcel of goods in the cargo, with the amount of the freight, duties, and other charges thereon.

Inward Charges. Pilotage and other expenses incurred in entering any port.

Ipswich. A town of England, capital of Suffolk County, on the Orwell. Although the Orwell is only navigable to the town for vessels of 500 tons burden, the town contains docks at which some of the largest vessels have been built, and at one time Ipswich-built vessels were considered equal to those built in any other part of the globe.

Iridium. A metal discovered by Dr. Wollaston, associated with the ore of platinum. It is gray, brittle, very infusible, and its specific gravity is about 13.6. It forms several oxides and chlorides, and combines readily with carbon. It takes its name from the Latin *iris*, the rainbow, in consequence of the variety of colors exhibited by its solutions.

Iris Ears. A name applied to the shells of the Haliotis,—a univalve mollusk found clinging like limpets to rocks.

Irish Horse. Old salt beef.

Irish Pennants. Rope-yarns hanging about the rigging; loose reef-points or gaskets flying about; fag-ends of ropes.

Iron and Steel. *Nomenclature.*—The ordinary classification of iron products has been pig-iron, steel, and wrought iron. Karsten established the logical, scientific basis of this nomenclature. But within about 15 years methods have been developed which produce large homogeneous masses of iron or steel at a single operation. Thirty years ago homogeneous masses of steel or iron were limited in size to a few hundred pounds at most, and the iron and steel of commerce was, with the exception of crucible tool-steel, produced in a pasty state as the immediate product.

The *homogeneity* of the new products was so striking as to suggest a classification based solely on the fact of the *product having been actually melted*, calling these products *steel.* This was highly illogical; for on the one hand usual homogeneous cast-iron castings would properly be called steel, and on the other, Mushet and others in France and England had long ago melted pure wrought or bar iron, which should also be called steel. This system has justly fallen still-born among metallurgists. Since 1876 the classification proposed by the International Committee of the American Institute of Mining Engineers has been recognized as the best nomenclature for all practical purposes. It has been universally accepted in Europe, and forms the basis of the official records of the German empire. It is therefore adopted in this article on account of its general use, as well as its intrinsic value.

All products of iron ores group themselves naturally in this nomenclature, except "native iron," *i.e.*, meteoric iron, which we may regard as a cosmical curiosity.

IRON.

I. Forgeable; difficult to melt.		II. Not forgeable; easy to melt.
A. Produced in a fluid state.	B. Produced in a non-fluid state.	C. Pig-iron.
1. *Ingot-iron* not hardening.	3. *Weld-iron* not hardening.	5. White pig-iron without graphite.
2. *Ingot-steel* hardening.	4. *Weld-steel* hardening.	6. Gray pig-iron with graphite.

Or in the order in which the products appear in manufacture:

1. Pig-iron.
2. Weld-iron (Schweisseisen, Fer soudé, Wälljern).
3. Weld-steel (Schweissstahl, Acier soudé, Wällstål).
4. Ingot-iron (Flusseisen, Fer fondu, Götjern).
5. Ingot-steel (Flussstahl, Acier fondu, Götstål).

The term *weld-iron* designates all varieties of wrought iron in which merchantable iron has been produced by welding up blooms from a pasty mass, or by welding together bars previously rolled from a puddled ball, or otherwise. It includes all kinds of iron not melted and poured. These latter are properly grouped in the term *ingot-iron*, the different kinds of which have been melted in a furnace or pot and poured into ingots. These are the "homogeneous iron" (Howell, 1856) with very little carbon melted in crucibles, and the same metal melted in the Siemens "open-hearth" furnace, or Bessemer converter. The weld-iron from its mode of manufacture and the presence of cinder among its particles retains a distinctively *fibrous* character, while the ingot-iron being free from cinder remains distinctively *granular* in all ordinary products.

It is an interesting fact that every known process of making *iron* will also make *steel.* Therefore we need the term *weld-steel* to designate steel made in Catalan and finery forges, and the direct reduction processes in blooms, from the puddling-furnace in balls rolled to bars, and from the cementing-furnace in bars. The products of the forge are commercially known as "German steel," of the cementing-furnace, as "blister steel" in bars, as they leave the furnace, or as "shear steel," when welded and drawn down for cutlery. The products of this class are all used as the raw material for cast steel, as steel containing a high percentage of carbon is called.

All steels which have been melted in any manner and poured into ingots are termed *ingot-steel.* Ingots of pot steel for tool and cutlery purposes are usually limited to the capacity of a single pot, in the Bessemer and Martin processes to 10 or 15 tons; but by methodical arrangements ingots over 45 tons in weight can be made at Essen by

Krupp, and at Creusot by Schneider, and extremely heavy ingots at Bochum, at the Russian Imperial Works, and at Firth's and Vickers' works in Sheffield.

The essential element of commercial iron is carbon. So extremely intimate is the connection that in practice iron without carbon is unknown, and so great is the influence of carbon that a very slight change in its percentage vastly changes the properties of the metal.

The total amount of carbon iron in any form is able to take up seems to be about 6 per cent. The least that exists in the purest merchant iron is about 0.06 per cent. Iron or steel capable of being *wrought* never contains more than 2.3 per cent. carbon, cast iron, fusible, and unworkable, beginning at that point. Nothing above 2.3 possesses market value as steel, and the only article that possesses any special value at this point is the *Wildstahl*, a product of Styrian forges, used for its extreme hardness as draw plates for wire.

In the other direction, the separation of steel from iron is quite as distinctly marked at and below 0.20 per cent. carbon; Karsten placed the line at 0.25 per cent. carbon, at which the metal would not harden even in *mercury*, while recent European authorities, like Akerman and Wedding, define 0.4 per cent. carbon as the point of division at which the difference in hardness before and after hardening begins to be noticeable.

Commercial steel is not, of course, a compound of iron and carbon alone, but contains usually, in addition, small quantities of silicon, sulphur, phosphorus, manganese, and copper, and also chromium, titanium, and tungsten. These elements, so commonly present, reduce the percentage of carbon required to impart sufficient hardness to give sparks with a flint to about 0.5 per cent.; in steel very free from these elements 0.65 per cent. would be required for the same effect. In the best Swedish and Styrian makes 0.35 per cent. carbon produces sufficient hardness to cause the iron to be denominated "steely."

These statements are based on the use of a heat at hardening proportioned to the content of carbon in the steel. But when the carbon falls below 0.15 per cent., the highest heat and the use of mercury as the most energetic cooling medium fail to produce any perceptible increase of the hardness.

When the percentage of carbon falls below 0.15, every effort to *harden* the metal results in *toughening* it and making it more *ductile*. When a square bar of ingot-iron is broken cold after nicking, the fracture is abrupt and the grain coarsely crystalline, while the other end of the same piece, nicked in the same way and broken after "*hardening*," will break with great difficulty, being distorted by the force required, and will present a silky, substantially fibrous fracture. Siemens-Martin boiler-plate is tested by means of this fact. Any ingot-iron plate is rejected which, after being heated to bright red and plunged into water, cracks when bent back 180° on itself. But the ductility developed is so striking that a common quality will stand much severer bending tests after this treatment than before it. All the splendidly bent specimens of open-hearth boiler-plate makers are thus toughened, and the boiler plates used at Crewe by the London and Northwestern Railway are toughened or annealed bodily before use. The *toughness* produced may be measured by the ratio of the elastic limit to the breaking weight before and after "hardening." In 30 specimens of Bessemer iron-plate from three Swedish works, given by Akerman, this ratio was reduced from 0.502 in the unhardened to 0.398 in the hardened, and in 4 specimens of Siemens-Martin iron-plate, from 0.418 in the unhardened to 0.389 in the hardened. Bessemer iron, ult. ten. 58,884 and 91,739 pounds resp.; limit elasticity, 29,584 and 36,553 pounds resp. Siemens-Martin iron, ult. ten. 54,759 and 77,232 pounds resp.; and limit elasticity 22,899 and 30,011 pounds resp. In the case of phosphoriferous weld-irons this effect is very striking, and the tenacity, elongation, and contraction of area of fracture may be increased by hardening. Poor open-hearth boiler-plate with 0.15 phosphorus will stand much severer bending tests after hardening than before. The writer proposed in 1875 this great development of toughness and ductility as an independent method of distinguishing steel from ingot-iron, and corroborated as it has since been by many facts and experiments, it may be used with advantage.

Ingot-iron is chosen for comparison as exhibiting this property best, but it is as well shown in kind, though not in degree, by weld-irons. In proportion as the weld-iron is denser or freer from cinder, "hardening" has a greater effect upon it, and the great increase of strength and toughness in pretty dense iron has been so long known that even Sefström refers to it, as Akerman states. The property has of late been turned to account for cannon, with the use of oil instead of water.

Metallurgical Chemistry.—The most important compounds are the oxides of iron. In its treatment for the production of refined metal, iron is not directly acted upon by air or oxygen, except in the Bessemer and refinery processes. In all others it is indirectly affected by oxygen absorbed in the cinder associated with the iron. Of this cinder protoxide of iron forms the base, the acid silica, and also alumina, being supplied by the ores, the iron, and the brick of the furnaces. The protoxide possesses a great affinity for oxygen, and will part with it freely and reabsorb it so long as the proper temperature is maintained. This fact and the affinity of iron for carbon form the basis of iron metallurgy.

The oxides of iron are noted with an atomic weight of 56 for iron, the old nomenclature with 28 atomic weight being inclosed in brackets.

Protoxide, $Fe''O''(FeO)$,	77.77 p. c. iron.
Magnetic oxide, $Fe''(Fe_2)^{vi}O''_4(Fe_3O_4)$,	72.41 " "
Sesquioxide, $(Fe_2)^{vi}O''_3(Fe_2O_3)$,	70.00 " "
Hydrated sesquioxide, $\left.\begin{matrix}(Fe_2)^{vi}\\ H_6\end{matrix}\right\} O''_6(2Fe_2O_3,3HO)$,	59.92 " "

The protoxide never occurs free in manufacture, possesses a strong affinity for oxygen and the power of decomposing water. The magnetic oxide occurs free as an ore, containing, when pure, 31.04 per cent. protoxide and 68.96 per cent. sesquioxide. The sesquioxide forms, with water, a true chemical combination, the basis of all brown hematite iron ores.

When metallic iron is heated the air oxidizes it rapidly, forming hammer-scale richer in oxygen than the protoxide, and sometimes reaching the sesquioxide itself. Moisture, especially when associated with carbonic acid or ammonia, oxi-

dizes iron rapidly, which can be counteracted by a coating of zinc, or the presence of lime or alkalies. Iron burns freely at a very high temperature in air, but can scarcely be volatilized by the highest attainable temperature.

The affinity of iron for *carbon* is most characteristic. Within a range of 0.06 to 6.0 per cent. we see almost entirely different metals with properties varying in extraordinary ways. This affinity enables the blast-furnace to be successfully worked.

In speaking of "*iron*," it must be noted that a *combination of carbon and iron is always meant*, pure iron being unknown in practice. The *alloys* of iron are unimportant, except that with *zinc*, which is commercially applied in *galvanizing*, with a coat of metallic zinc. The combination of iron and carbon with tin enables plates to be covered in a similar way with a coat of metallic tin. Iron and carbon also combine easily with chromium and aluminium, and with difficulty with titanium and tungsten.

The combination of carbon with iron is both chemical and mechanical; the latter when the carbon separates in flakes as *graphite* in pig-iron, in which, in those varieties containing most carbon, it may be separated as graphite by slow cooling, and be recombined by quick cooling, *i.e.*, chilling.

In true steel the combination is purely chemical, though free graphite is often, if not usually, present. The effect of hardening is to cause the carbon to entirely combine with the iron in steel, and the experiments of Caron have shown that hammering has the same effect.

The other elements most intimately associated with iron (and carbon) are *sulphur*, *phosphorus*, *silicon*, *manganese*, and *copper*.

Sulphur has great affinity for iron at a low red heat, and is almost universally associated in the form of pyrites with the ores, and by reduction with the iron. It tends to prevent the formation of graphite in pig-iron; to reduce the total percentage of carbon; also, to make pig-iron melt with difficulty and run pastily and shrink strongly, so as to unfit it for castings when present over 0.6 per cent. The influence of sulphur on wrought iron makes it rotten at a red heat (red shortness), and injures its weldability materially; its effect on steel is similar. A percentage of 0.01 is quite perceptible, of 0.05 quite injurious, and 0.1 makes both bar-iron and steel nearly useless. It must be removed in the blast-furnace.

Phosphorus is as intimately associated with iron as sulphur. It increases the fusibility of pig-iron, and up to say 0.5 per cent. improves it for castings, but more reduces the strength. It assists the separation of graphite. It is often present up to 1.0 in good pig-iron, and 5 or 6 per cent. in iron used for Berlin castings. In wrought iron phosphorus causes the iron to weld and work easily when hot, thus antagonizing sulphur (but not *neutralizing* it, in a strict sense), but makes cold iron hard and brittle (cold shortness). A weld-iron low in carbon may contain 0.3 per cent. without injury, and when harder 0.2 without injury, the latter amount also being possible in passable ingot-iron with 0.10 per cent. carbon or less. Steel, however, of any kind is injured materially by phosphorus; one can note the presence of even 0.01 per cent. distinctly, and no reliable steel can contain more than 0.10 if soft, or 0.04 per cent. if harder. Phosphorus is freely removed in puddling and reheating, by its sweating out with the cinder; it cannot be removed in the blast-furnace.

Silicon is found in all kinds of iron, and its effects are similar to those of phosphorus, but graver. It makes wrought iron rotten at a red heat, 0.05 per cent. injures iron or steel seriously, and 0.4 makes both entirely useless in presence of other deleterious elements. If, however, steel is quite free from phosphorus and sulphur, as are crucible steels, it will bear from 0.15 to 0.25. The presence of this amount of silicon is *characteristic*, as other steels—as Bessemer, etc.—usually contain less than 0.1. The presence of silicon enables steel to be poured free from blow-holes. But for metallurgical purposes silicon is an essential element of pig-iron, as its burning during refining forms necessary cinder and generates great heat. White pig-iron contains seldom more than 1.0 per cent., gray usually 2.0, often as much as 5.0 (Scotch), and for Bessemer purposes 3.0 is generally liked.

Manganese is a common and most beneficial element. In pig-iron it is present up to 40.0 per cent. from the blast-furnace when specially made; often up to 10.0 or 12.0 per cent. from manganiferous ores. It may be combined with iron and carbon up to 90.0 per cent. manganese (ferro-manganese) for the Bessemer and Siemens-Martin processes, a white soft leadlike substance extremely oxidizable. In pig-iron it makes the metal white, and causes the chemical combination of the carbon up to the greatest possible content, nearly 6.0 per cent. This form of iron is called Spiegel iron (mirror iron), from its broad, brilliant crystals. Manganese develops great heat in burning, forms an easily fusible cinder, and materially aids in removing the ordinary impurities from iron in refining, while in the blast-furnace it increases the fluidity of the slag. It is seldom present in iron to any great extent, but is usual and beneficial to steel up to 0.3 per cent., or even 1.0 per cent. in special cases. It antagonizes red shortness. Being extremely oxidizable it takes the function of carbon, when the latter is purposely kept low, in removing oxides from the metal and enables a milder steel to be made. So long, however, as carbon is present in any considerable quantity the manganese remains but slightly acted on and goes into the metal. Manganese, if present in decided quantity, say over 0.4 per cent., is apt to make steel fly to pieces or crack in hardening; 0.25 per cent. will have this effect if phosphorus be present over 0.02 per cent. More than 1.0 per cent. makes low steel brittle when cold.

Copper is a very common impurity of iron, more seldom of steel, as it is where possible excluded from the latter by the choice of material. It acts similarly to sulphur, and about as strongly. A percentage of 0.5 is highly injurious.

A statement of the relative *hardening* power of these elements on steel very approximately exhibits relations of importance. If one unit of phosphorus, say 0.01 per cent., will produce a certain amount of hardness or brittleness, 2–3 units silicon, 5 units carbon, and 7–8 units manganese will produce the same effect. It would be truer to say that carbon increases strength and the other elements brittleness, for the best

steel is that which contains least phosphorus, sulphur, and silicon.

Ores of Iron.—1. Magnetic iron ore. This consists mainly of the magnetic oxide of iron, and can, of course, never contain more than 72.41 per cent. metallic iron. It often contains a sesquioxide, and rarely carbonate of iron. Quartz, chlorite, or hornblende are its principal gangue, and magnetic pyrites, iron pyrites, copper pyrites, and apatite its principal impurities. The amount of impurity varies of course, but the ore ranges from 40 to 60 per cent. iron. In the Lake Superior region the No. 1 ore is guaranteed 60 per cent.

It occurs principally in primary massive or schistose rocks, exceptionally in the Devonian (Siegen district) or Lias (Rosendale, England).

It is in general a red, short ore, tending to produce a hard, not very gray iron, on account of its comparatively difficult fusibility.

2. Franklinite, a combination of iron, zinc, manganese, and oxygen with 45 per cent. iron and 20 per cent. zinc may be regarded as an ore of iron. Its principal use is for spiegel iron, rich in manganese, after the extraction of the zinc for zinc paints. It occurs only in New Jersey, near Franklin.

3. Red hematite, or Specular ore. The ore occurs crystalline in plates or crystals (rhombohedric), as specular ore in Elba and Lake Superior. In spherical aggregations with fibrous texture in the west of England associated with the ore in a sandy form more or less hard. Also massive, as red hematite in England, Spain, Lake Superior, and Algeria. Also in oolitic beds with lenticular formation, as in Northern New York.

The ore in whatever form leaves a characteristic red streak when rubbed on rough porcelain. Its principal gangues are calc spar in Spain, quartz in Lake Superior. Generally clay and often pyrites and apatite occur with it, the latter in inconsiderable amount. The average contents of iron is 30 to 40 per cent., though the Spanish and Algerian ore is generally over 50 per cent., and Lake Superior over 50, with enough of greater purity to form a grade of 60 per cent. guaranteed.

It is found in all rocks, from the oldest to those of the coal formations. It occurs abundantly in all parts of the world, and makes as a rule the best iron. The Spanish swords owe their fame from immemorial time to the splendid deposits near Bilbao, which are now used in all countries for pig-iron for steel.

Massive red hematite makes in the blast-furnace a neutral iron of great purity, which is now almost exclusively devoted to the manufacture of steel of all kinds.

4. Brown hematite is a widely-distributed ore in all formations. It consists of the hydrated sesquioxide of iron, and is often associated with other ores as the result of their decomposition. The brown hematite in the soil of the valleys along the edges of the Silurian formation in the United States seems largely derived from the oxidation of the iron pyrites in the older slates.

The ore occurs in every form with a principal gangue or admixture of clay, also quartz in the massive forms, and in general calc spar and dolomite. A very frequent accompaniment is manganese ore. The Bog-iron ores come under this variety, and are now in process of formation in ponds or bogs along our eastern coast and in Sweden. Sand is, of course, a large impurity, and the bog ores are almost valueless from their cold shortness.

The value of the ore varies greatly, and that which occurs massive is generally the most valuable and most used. Although seldom injuriously red short, the ore occurring in the older formations are generally red short, while that of the new formations is cold short often to a very great extent.

In the purest varieties the percentage of iron may sometimes, but rarely, be as high as 60 per cent., but will probably not average more than 30 per cent., often falling lower. Much of this ore cannot be worked at all on account of small percentage of iron.

5. Spathic iron ore. This ore is a carbonate of the protoxide of iron, and cannot contain more than 48.2 per cent. iron. It also contains carbonate of protoxide of manganese in the crystalline varieties, having often as much as 11 per cent. manganese oxide. What goes under this title is usually more or less crystalline. It usually contains little or no hurtful impurity.

The percentage averages between 30 and 40, but may always be increased by roasting, often to more than 50 per cent. It makes iron of the greatest purity and value for all purposes, especially steel. Its greatest development occurs in the Siegen district of Westphalia, where 500 veins, of 6 to 20 feet thickness, are worked, and in Styria and Carinthia, in Austria, where enormous deposit exists; over 150 feet of ore at Eisenerz. Krupp and the Austrian Royal Works depend largely on this ore.

A variety of this ore, however, occurs massive in the Lias formation near Cleveland, 15 to 22 feet thick, which has given rise to the most considerable iron district in England, since its discovery by Bolkow in 1847. Its percentage of iron averages about 34, always enriched to more than 40 by roasting, and it is quite cold sheet.

6. Clay ironstone, or argillaceous iron ore. This consists of the carbonate of iron in admixture with clay, and sometimes sand, and more or less water. The carbonate is found generally intimately mixed with clay in nodular masses with conchoidal fracture, which are distinctively argillaceous iron ore, often in this country called *carbonate ore.* Often, in England, these nodules disappear, and the ore and clay form a continuous stratum called *clay band.* The percentage of iron varies between 25 and 35, but may be enriched by roasting. This ore is found in this country, principally in the lower coal-measures of Pennsylvania and Ohio. In England nearly two-thirds of the iron product is derived from this ore in its different varieties.

Black-band Ore.—When the argillaceous iron ore is found in connection with coal veins it carries a considerable quantity of coal, makes a black streak on porcelain, and is called black band, the term given by the Scottish miners. Its principal occurrence and first discovery (Mushet, 1801) are in Scotland, near Glasgow, where it yearly produces in a small district about 900,000 tons of pig-iron.

It carries 10 to 25 per cent. of coal, which enables the ore to roast itself, burning with a good deal of vigor. Its content of iron varies much, and will average 25 to 30.

In the United States this ore is of very little value, occurring seldom, and very sandy.

Analyses of Iron Ores.

	I.	II.	III.	IV.	V.	VI.
Peroxide of iron......	63.18	70.98	57.88	64.57	0.70	....
Protóxide of iron.....	26.52	....	....	....	49.50	43.30
Mangano-manganic oxide..............	0.12	....	....	....	....	....
Manganic oxide......	....	....	0.60	1.45	....	....
Protoxide of manganese	....	....	....	....	1.64	1.08
Sesquioxide of cobalt..................	....	....	....	0.18	....	....
Alumina................	3.23	2.01	4.05	2.63	1.15	....
Lime	0.38	0.45	0.16	0.05	1.86	1.26
Magnesia	trace	0.20	1.08	0.05	2.02	2.67
Silica.....................	6.68	25.12	24.40	19.02	5.79	7.20
Carbonic acid.........	....	....	....	....	34.90	28.46
Water, etc..............	....	1.08	11.05	10.97	1.40	....
Phosphoric acid......	0.05	0.13	3.46	1.03	0.21	0.67
Sulphuric acid........	....	....	....	0.01	trace	....
Sulphur.................	0.01	0.03	none	....	....	0.26
Carbonaceous matter.....................	....	....	....	....	0.73	15.10
Totals.................	100.19	100.00	99.69	99.96	99 90	100.00
Metallic iron.........	64.86	49.33	40.50	42.20	39.00	33.68
Phosphorus	0.02	0.05	1.51	0.45	0.09	0.29
Sulphur.................	0.004	0.03	....	0.003	0.01	0.26

I. Is the best grade of Crown Point, Lake Champlain *magnetic ore.* It often contains much more phosphorus, and sometimes as much as 16 per cent. titanic acid.

II. *Second class* Lake Superior *red hematite,* McCracken mine. The first-class ore contains over 60 per cent. iron, and less than 8 per cent. quartz or silica.

III. *Fossil red hematite* from Clinton, Northern New York, representing the oolitic varieties of the ore.

IV. *Brown hematite* from Chestnut Hill, Pa., representing the best ores of the Siluro-Cambrian formation. They are frequently far more cold short, and seldom richer in iron.

V. *Carbonate ore* from Pittsburgh Coal Horizon, in Fayette County, Pa. These ores are usually more cold short.

VI. *Black band* from Llanelly, Wales, characteristic "Mushet stone," contains from 3.3 to 8.0 per cent. coaly matter in the vein proper. The sulphur exists as pyrites.

METHODS OF IRON PRODUCTION.—Only two methods are open to iron-workers. Either the ores are reduced at a low temperature directly to steel, and after reduction, if iron be desired, the carbon burnt out sufficiently by exposing the "loup" to the blast, or the ores are powerfully reduced with an excess of carbon, and the resulting iron forced to take up carbon with formation of pig-iron. The older methods using the Catalan and associated forges, all proceeded in the first way, and make to this day both steel and iron wherever the richest ores occur with plenty of charcoal, as in the Adirondacks and Germany. But it was long ago apparent that the best product was got by first making pig-iron, and then oxidizing it to burn out the carbon and other elements by various refining processes. This change took place about 1546, as described by Agricola. We shall consider the reduction process first, as its logical place in the operations of the present day.

The Blast-furnace.—The general idea of a blast-furnace may be put as that of a tall cylindrical shaft of considerable capacity, whose internal shape is in general the result of placing a cone on the base of another cone inverted. Three or more cones may often be traced, or the section may be formed by a segment of a circle sweeping from top to bottom. The shapes are not the result of fancy; the process itself dictates some details, the kind of pig-iron sought and the fuel used the rest.

Where the bases of the two cones meet the greatest area for a given height is found, and this is called the boshes. As the inverted cone narrows downward it takes the name of *crucible,* and that of *hearth* in its smallest dimensions at the bottom. In this country only hearth and boshes are usually distinguished. The top of the upper cone is called the *throat,* and its opening the *tunnel-head* of the furnace. The *tuyeres* pierce the walls of the crucible at a height (30 to 70 inches) sufficient to contain all the iron that can be melted in 8 hours, along with a covering of 10 to 18 inches of slag, for the pig-iron must not, when formed, be exposed to the action of the blast.

The object of the shape is to supply the materials regularly as they are melted in the hearth, and at the same time in a condition open enough to be acted on and reduced by the ascending gases. The object of the boshes is both to hold such a supply as will cover all irregularities in melting, and to reduce the temperature quickly to such a degree that the ore cannot be melted into cinder before its entire reduction and the carbonization of the iron. The carbonization takes place in the zone of greatest heat, a frustum of the cone above the tuyeres not more than 2 feet high. The coal, limestone, and iron-sponge preserve their shape even at this point, which they reach so hot as to melt away like wax. A *tapping-hole* is provided at the lowest point for the iron, and a *cinder-notch* just below the tuyeres lets the slag out at proper intervals.

The exterior of the furnace is now as nearly cylindrical as may be for convenience of bracing, either by an entire iron shell inside of which the furnace is built, or by flat bars tightened round the brick-work after its erection. In both methods the lower part of the furnace is supported on columns to afford free access all round to the hearth and tuyeres.

The size of furnaces varies greatly, owing to the great difference in ores and fuel. The smallest are *charcoal* furnaces, ranging from 452 to about 2000 cubic feet internal contents. The *anthracite* furnaces of Pennsylvania and Wales vary from 2000 to 6000 cubic feet. *Coke* furnaces vary from about 3000 to 42,000 cubic feet. *Raw coal* furnaces in Scotland average 7000 cubic feet and a product of 180 tons a week.

The *product* of charcoal furnaces varies from 7½ to 30 tons a day, according to size and ore. In the other classes 20 to 40 cubic feet produce a ton of iron per week with good management. In the largest furnaces with poor ores 50 cubic feet per ton per week are often required in Cleveland, and on the other hand, with the richest ores, high heat, and an ample blast, about 11 feet of cubic contents produce a ton per week at the Edgar Thomson Works near Pittsburgh; where 1300 tons are made in a furnace of 20 feet bosh.

Blast-furnace accessories.—The heart of the whole process is the blowing-engine, which as now made is usually a short-stroke engine, about 4 feet stroke, making 30 to 70 revolutions per minute, and with a blast-cylinder 60 to 84 inches diameter, according to volume of blast desired. The steam-cylinder varies in diameter according to pressure desired, for a 72-inch cylinder 32 to 38 inches. The fly-wheels vary with the engines from 9 to 16 tons to preserve uniformity of motion. It is useless to cut off steam less

than ⅝ stroke or more than ⅝ as engines are ordinarily situated, counting the vicissitudes of steam-supply and the necessity of blast of uniform pressure. An engine taking steam more than ⅝ stroke would take more than its share of the available heat. Long-stroke engines have been considered more durable, and in this country, with 84-inch blast-cylinders and 7-foot stroke, they have a very good record.

The blast, if used cold, would have very little power except in small charcoal furnaces with easily reducible ores, and it has been used hot since Condie invented the water-cooled tuyere in 1830. The waste gases had been in 1814 used for steam by Aubertot, and they were immediately applied to heating the blast, thus rendering the blast-furnace a complete organism independent of any source of heat except the coal charged with the ore.

Hot-blast stoves were at first cast-iron pipes of every imaginable form, the object being to expose the greatest amount of heating surface in the stove where the gas was burnt. The Scotch U pipe, where the cold-air pipe ran along one side of the stove carrying a number of U or siphon-pipes connected with the hot-blast pipe on the other, has been superseded by a form of stoves in which several bed-pipes run across the stove carrying close-legged U pipes, often 14 feet high and 9 inches in diameter, the bed-pipe being intercepted by diaphragms, which force the blast up and down through 5 double legs, or about 140 feet, before reaching the hot-blast side or connection. In order to avoid unequal heating and burning the pipes the waste gas is now burnt in a special chamber below and connecting with that containing the pipes, and called the *combustion-chamber*.

Cast-iron stoves rarely, if ever, have more than 3 square feet of heating surface to the cubic foot of blast. The majority probably not more than 1½ square feet. The limit of constant heat producible with safety to the pipes is 900°, or thereabout, and the friction of the blast in passing through them is considerable. As far as possible the area of the pipes should be increased in accordance with the formula $1 + 0.003t$; t being temperature to which blast is heated. At the Moselem Furnace, in Pennsylvania, where cold-blast anthracite iron used sometimes to be made for short periods, the engine made 38 revolutions with 3 pounds pressure, but when the blast was turned through the stove for ordinary iron only 28 revolutions could be made at a pressure of 5 pounds per square inch.

Of late years, however, the regenerative fire-brick stoves, incapable of injury, and with a vast heating surface, have been found preferable, where the expense can be met. They afford about 8 square feet of heating surface to the 1½ of a cast-iron stove, and blast may be delivered at 1500° unvaryingly. They are used in sets of 3 or of 4, with one to spare, the gas being burnt in two while the third is heating blast. They are of the Whitwell and Cowper types, both covered by the Siemens principle.

The other accessories are steam-boilers fitted to be fired with the waste gas from the furnace; pumps to supply the tuyeres, etc., with water, 1500 to 2500 gallons per hour being used by a furnace with bosh 14 feet in diameter.

The *hoists*, by means of which the *charges* are raised to the tunnel-head, are of almost every possible construction, some with a water counterbalance, others with steam hoisting-engines, with air-cylinders working by vacuum or by pressure, with steam direct, and water-pressure direct and indirect.

Materials.—Ore, fuel, air, and flux are the materials of the process.

The ores are generally prepared, except in the case of open red hematites, by crushing to convenient size, and roasting before they are charged. They are sometimes washed with water to remove sulphates formed in roasting, and in Bohemia, with weak sulphurous acid, to remove phosphate of lime. Uniformity and moderately small size improves the working of the furnace. An average of 2½ tons of ore to the ton of iron is thought a good one in the United States, and about 1⅝ tons is the best attainable. It does not pay to work ores which will not make a ton of iron with less than 3¾ tons.

The *fuel* may be either raw bituminous block-coal, as in Scotland, Ohio, and Indiana; coke, as universally used; anthracite, in Eastern Pennsylvania and Wales; or charcoal, as in Sweden, Germany, Russia, and United States. Coke well made, from coal washed to remove pyrites and ash, is probably the kindest and best fuel, enabling the quickest work. Anthracite is more refractory, requiring a higher temperature and blast-pressure. Charcoal burns so easily that it will not support either a high temperature or much blast. With coke, 1 ton to the ton of iron is the best practice; with anthracite, about 1¼ tons, usually 1½ tons; with raw coal, 2 tons (Scotland) to 3½ tons (U. S.); and with charcoal, 110 bushels, or about 1980 pounds per ton, with hot blast, and 205 bushels, or 3690 pounds, with cold blast.

Air is required to furnish oxygen. By volume air contains about 21 per cent. oxygen, and by weight 23 per cent. By weight, averaged the year round, the percentage of water is not less than 0.2, as furnaces must be situated in valleys where they can get water. Water vapor is deleterious, as returning less heat than it takes to decompose it, and furnaces which make gray iron in winter often cannot keep up heat enough, from this cause, to do so in the spring when the air is saturated. Under ordinary conditions about 6 tons of air are required per ton of iron, and more can be profitably used.

The *flux* is usually limestone, as free from magnesia as possible, and must be charged in such proportions as to maintain a slag *acid*, with silica for charcoal furnaces, and *basic* with lime for coal and coke furnaces. On an average 1½ tons to the ton of iron is required, much depending, however, on the original composition and mixture of the ores.

About 6 tons of solid material is estimated as the average required for a ton of iron.

Process.—This is mainly a powerful reduction in the upper part of the furnace by means of carbonic oxide at a comparatively low temperature, and a carbonization in the zone of greatest heat. Before the tuyeres carbonic acid is formed, which, as it ascends, is soon reduced to carbonic oxide by the glowing coal in the charges. Other metals are reduced, of course, beside iron, and the hotter the furnace the more silicon and the less sulphur are present. In manganiferous

ores, the greater the heat the more manganese is reduced, and the less graphite is present. Substantially all the phosphorus in the ore and coal goes into the iron.

The shape of the hearth and boshes depends on the iron desired. For forge-iron a capacious hearth is used, quickly widening upward, that the heat filling a large space may be less intense; this is especially the case where *spiegel* or full white iron is made. But for gray iron the hearth is comparatively contracted, and every means taken to increase the temperature. In using the Cowper and Whitwell hot-blast stoves, with enormous reserve of heat, it is found that one is comparatively independent of form of hearth or of moisture, and production can be driven to the utmost extent. We are beginning to find that it is advisable to use a great amount of blast, both for regularity of working and quality of iron.

Products.—Gas, slag, and pig-iron. The *gas* consists of nitrogen, with carbonic oxide and acid, some cyanides, and the fumes of any volatilizable oxides there may be, such as zinc oxide. The carbonic oxide, although only about 20 to 28 per cent. by volume, produces more than sufficient heat for steam and heating blast, with some available for roasting ores.

The gases furnish the means of regulating the operations of a blast-furnace and calculating its economy. Bell found that with Cleveland ores the gases should contain about 737 pounds carbon to the gross ton of iron produced and escape at about 600°. In this country, Mr. J. M. Hartman finds that with a healthy furnace the gases should not escape higher than 275°, and are often as low as 180°. Mr. Hartman has suggested a most useful "carbon duty" formula, based on the fact of the furnace having a constant requirement of 2179.19 calories for the heat carried off by conduction, and in the gas, cinder, and iron, and throwing the duty on one ton of carbon. Thus, the duty performed may be ascertained by the weight ratio of the carbonic acid to the carbonic oxide in the gas. Thus, in a year's work of a coke furnace this ratio amounted to 0.99 of the carbonic oxide, and the constant requirements to 23 per cent. of the entire heat produced. The furnace is doing good work in proportion as its constant requirement falls below 23 per cent. and as the ratio of carbonic acid to oxide approaches 1 to 1.

The *slag* makes considerable labor to dispose of it, as rarely less than 1½ tons and often 4 tons or more are made per ton of iron; the poorer the ores the more slag. It is capable of application for bricks, for cement, and for mineral wool.

Pig-iron is not by any means pure iron; charcoal iron containing not less than 3.5 per cent., and that made with mineral fuels rarely less than 6.5, and sometimes 10.0 per cent. of other elements. In spiegel iron 17 to 27 per cent. is of other elements, of which 9 to 22 is manganese. This is an important feature in refining.

According to the state of the carbon and the varying grain and color, iron is graded often into 8 grades, but in U. S. usually into 5.

1. No. 1 Foundry. Dark gray, large crystals, graphitic, soft.
2. No. 2 Foundry. Lighter gray, small crystals, less free graphite, and less open texture.
3. No. 3 Foundry, or gray forge. Quite light gray, little free graphite apparent, and close texture, crystals hardly showing.
4. Mottled iron. A mixture of gray iron with white iron, hard. An intermediate grade is often inserted as a No. 4, in which the white iron is less than about ¼th, mottled being then called *full mottle*.
5. White iron. Full white, crystals more or less large, brittle.

Analysis of Pig-Iron.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.
Graphite	2.970	2.860	0.43	....	....	3.760	2.936	2.06	2.92	2.09	2.12
Combined carbon	0.110	1.380	3.06	4.770	4.632	0.658	1.095	1.78	0 76	2.08	0.78
Silicon	3.114	1.409	1.29	0.820	0.367	1.017	2.200	0.85	1.59	0.59	0.99
Slag	....	....	......	....	....	....	....	0.15	0.48	0.12	not det'd
Sulphur	0.101	0.198	0.10	trace	none	0.021	trace	0.01	......	......	0.06
Phosphorus	0.999	0.546	0.95	0.134	0.196	0.106	0.070	0.53	......	......	0.29
Manganese	1.037	0.289	2.99	11.120	11.586	0.756	3.450	2 32	......	......	0.15
Copper	0.130	....	......	....	none	....	....	....	......	......	....
Cobalt	0.081	....	......	....	....	....	....	....	......	......	....
Calcium	....	0.141	......	....	trace	trace	....	0.05	......	......	....
Magnesium	....	trace	......	....	trace	trace	....	0.03	......	......	....
Aluminium	....	....	......	....	none	0.021	....	0.12	......	......	....
Sodium and potassium	....	....	......	....	....	....	....	0.01	......	......	....
Iron	91.458	93.050	91.18	83.156	83.250	93.661	90.249	92.50	......	......	95.61
	100.000	99.873	100.00	100.000	100.031	100.000	100.000	100.41			100.000

I. Is Dunbar foundry pig-iron from carbonate ores and coke. Analyst, McCreath. II. Isabella forge pig from Lake Superior ores, mill cinder and coke. McCreath. III. Nearly white iron from Gleiwitz, brown hematite and coke. Finkener. IV. Characteristic German spiegel iron. Tookey. V. Franklinite spiegel iron, New Jersey ores. McCreath. VI. Bessemer pig No. 1, Crane Iron Co., Lehigh Valley, from magnetic ores and anthracite. McCreath. VII. Bessemer pig, manganiferous; Zwickau, quoted by Petzholdt. VIII. Average composition of 13 first-class U. S. guns (regulations of 1841), by Morfit. The per cent. iron is too high, probably containing phosphorus, owing to method of analysis. IX. Average composition, *hot-blast* charcoal iron, in U. S. guns, for elements quoted, Morfit. X. Average composition, *cold-blast* charcoal pig, in U. S. guns. Morfit. XI. Belgian ordnance cast iron, analyzed by Abel.

The *melting-points* of white iron may be taken at 1900° to 2000°, and that of gray iron at 2000° to 2100°. Gray iron becomes fluid at once, while white goes through a pasty state on melting.

The *specific gravity* of dark-gray iron is 6.635 to 7.275; of medium gray, 6.916 to 7.572; and of white iron, 7.056 to 7.889.

The specific gravity, tenacity, and hardness of

Greenwood charcoal pig-iron were determined by Wade, as follows:

Pigs.	Sp. Gravity.	Tenacity.	Hardness.
No. 1	7.004	14,486	8.48
No. 2	7.153	27,153	13.86
No. 3	7.245	34,424	21.40

The highest tenacity, 40,897, of Greenwood iron was associated with a specific gravity of 7.272, the strength decreasing from that point as the density increased. Each pig or mixture of iron has a similar definite point of highest tenacity, the range of density for ordnance lying between 7.20 and 7.35 as extremes.

In castings of this high grade charcoal iron for guns, the appearance of the fracture shows the quality. In smaller castings, a somewhat close grain of regular gray fracture, with a jagged uneven surface, taking hold of the finger like a rasp, indicate a metal of the highest tenacity. If the grain be uneven in color and texture, and the surface comparatively smooth, the tenacity is lower. In large masses the grain will be quite coarse and fracture more jagged, and the color very light gray, with darker spots rather sparsely intermixed.

WELD-IRON—WELD-STEEL.—As iron and steel are habitually made by the same methods, in the same apparatus, they must logically be associated in any description of processes involved.

Either may be made by reducing directly from the ore, that is, burning its oxygen out with carbon, or by burning out the carbon of pig-iron by means of the oxygen of the air. In either method the action may be carried further than necessary to produce steel, and the carbon be introduced again by cementation with charcoal. As a curiosity, steel can be made from pig-iron bars heated in sand with slight access of air (Tunner's steel).

The first of these methods is usually called the *direct*, the second the *indirect*, *method* of producing iron.

The direct methods include the following:

1. *Catalan forges.*
2. *The iron-sponge processes.*

The indirect methods are,—

1. *The finery forge.*
2. *Puddling.*
    a. *Puddling proper, including refining.*
    b. *Boiling.*
    c. *Rotary puddling.*
3. *Cementation.*

The *Catalan forge* is the oldest known method, having been practiced in some form from the remotest antiquity. It is synonymous with the old English *bloomery*, although the method was abandoned in England nearly 150 years ago.

The Catalan forge, as improved in Catalonia, a province of Spain, is a low small hearth, in which a single tuyere is used, blown by a bellows, or a *trompe* or water-jet blast apparatus, at a pressure of about ¼ to ½ pound per square inch (power utilized, 10 per cent.). The fire of charcoal is built in the small nearly square hearth, mainly in two different ways. In the old Catalan the charcoal is at the back, over the tuyere, and the ore is laid in, and afterwards fed, at the front. The bottom is of charcoal. In working, the ore partially reduces, partially goes into a cinder, which covers the iron as it forms. The loup is kept in the hottest place before the tuyere, and the first cinder is tapped off as impure, and afterward let off every hour. The forgeman works the ore into the fire with his bar, opening up the fire also, and when enough ore has been supplied clears away the charcoal, presses the loup together, and lifts it out to the hammer. The loup weighs about 350 pounds, and the process lasts 6 hours. The loup is cut at first into 3 pieces, which are reheated over the fire at the next heat and drawn down. About 1000 pounds of ore are used each time, and 100 pounds of iron require about 300 pounds ore and 340 pounds of charcoal. In the *Genoese* forge the ore is roasted beforehand by the waste heat, and scrap-iron is used along with the ore. The yield is thus increased to 5 heats a day, and the consumption of charcoal diminished about a third. The weekly product is about 4 tons.

The *German Catalan forge* is worked differently. On a bed of charcoal waste ore is first melted, and then the rest of the charge of ore is laid on in layers alternating with the charcoal. The heat lasted 6 hours, and the loups weighed about 75 pounds. To 100 pounds iron about 800 pounds ore and 438 pounds of charcoal were used.

These German bloomeries have been developed in the United States on rich magnetic ores with very good results. Their greatest number is now in the Adirondacks, where they have the characteristic feature of using a *hot blast* heated by traversing pipes placed in the flame of the fire, which is sometimes also used for steam for blowing-engine, with slight additional fuel. In the Adirondacks the hearths average about 22 × 30 inches (660 square inches), by 13 inches deep, with walls at the sides, open at the front, and the D-shaped tuyere at the back. The ore thrown on the fire is reduced, some of it being converted to slag as it works down through the fire. At frequent intervals the cinder is tapped out, and every 3 hours the loup is dug up, weighing about 300 pounds. A fire makes about 2400 to 3000 pounds per day. The loups are forged into *slabs* for boiler-plate, or *billets* for cast steel. One gross ton of blooms requires 1½ tons dressed ore (or about 3 tons raw ore), and 2 tons, or 250 bushels of charcoal, with warm blast, against $2\frac{4}{10}$ tons, or 300 bushels, with cold blast.

The Damascus or wootz steel, and the "Wolf" of iron or steel, were made in a high forge, which may be called by its Swedish name of *Osmund furnace* or *forge*. It gave rise to the blast-furnace, increasing in size and product as the means of blowing it were invented. The small East Indian forges were of clay, built in a bank or wooden frame, about 3 to 6 feet high and 18 inches square. They produced 10 to 180 pounds per charge or heat, which was often allowed to cool in the forge. The German *Wolf furnace* produced "wolves" of about 500 pounds of iron in 8 hours with about 2189 pounds charcoal.

The *iron-sponge processes* represent a vast deal of fruitless labor. Of all tried only the *Siemens* and the *Wilson* methods are in use in each case, so far as we know, by the inventors only. *Chenot* (1831) endeavored to reduce ore by charcoal or carbonic oxide in vertical chambers externally heated. The resulting mass was powdered and the sponge separated by a magnet, and used for cast steel by melting in crucibles. *Clay* (1837) reduced ore with charcoal in clay retorts open-

ing into a puddling-furnace, where the sponge was worked out. *Renton* (1851) substantially the same, except attempting to weld the sponge into blooms, and *Harvey* the same, with the substitution of inclined soapstone trays. *Smith* (1855) attempted to reduce ore direct in the puddling-furnace, using petroleum vapor to carbonize the sponge; *Gurlt* (1857) used Chenot's apparatus in a similar way, letting the sponge fall with its impurities upon a furnace hearth, where it was melted. *Whelpley & Storer* applied the same method, blowing a mixture of powdered ore and coal upon the hearth of a puddling-furnace. Rogers (1862) used Clay's methods, but substituted a *rotating* retort. *Dupuy* (1874) proposes a mixture of ore and charcoal in a box of sheet-iron to hinder oxidation. *Wilson* applies the inclined tray or surface, reducing the ore on it and using the resulting sponge in a bloomery forge. *Siemens* (1870) combined Clay's and Roger's plans, melting the sponge in a bath of pig-iron in a rotary furnace. This is still in operation at Landore, and is not strictly a direct process. *Blair* (1872) improved Chenot's plans; cooled the sponge before contact with air, compressed it cold to a bloom, which was either worked in the heating furnace or melted into soft steel. The objections to the sponge processes proper are great waste of iron and of fuel, the difficulty of welding the sponge, and the intermittent character of the work.

The *indirect methods* all demand pig-iron as their raw material.

The oldest one is the *finery forge.* It produced till 1784 all the iron, and till 1839 the most of the steel used, and was worked on almost numberless methods, dictated by the circumstances or caprice of the operators. It made iron or steel with equal facility, a change of the force and direction of blast and the quantity of cinder allowed to cover the ball constituting the only changes; for steel the ball is protected as much as possible, and for iron exposed to oxidation as much as is safe. The process is slow as compared with its successors,—5 tons per week being a good yield. This quantity would be puddled in 1½ days, or made into Bessemer steel in 20 minutes. The product is adapted to special purposes, and in this country now furnishes most of the best boiler-plate (C. H. No. 1 Flange and better grades) and sheet-iron, while in Wales it makes tin-plate iron. The Lancashire and Walloon methods are most followed, the latter in Sweden, for the production of Dannemora iron.

In the Morfa tin-plate works, as described by Percy, and in the other Welsh works, the iron was first melted in a coke *melting finery*, and then about 250 pounds run into the charcoal *finery*, prepared from the previous heat. The cold blast was let on, and the iron becoming pasty, was broken up and exposed to the blast. In 43 minutes cinder was tapped off, and the metal begun to be pressed into a ball. The cinder was tapped out frequently, and in an hour the blast diminished. In 73 minutes the blast was lessened and the ball taken out and hammered into a flat slab, which is afterward broken up into stamps of 26 pounds each. These are then piled on a *porter-bar* (about 80 pounds), and being heated in a hollow coke-fire, like a blacksmith's fire, are welded, hammered into slabs about 6 inches wide and 3 inches thick. These slabs are nicked, and one-half double back, and welded on the other, so as to make both sides of the tin-plate alike, hammered down again, cut off from the bar and rolled into plates. This process is substantially used in Pittsburgh under the name of "knobbling fire."

In Sweden pig-iron is used in plates which have been broken up and heated beforehand by the waste heat of the fire. The hot fragments are placed in the hearth with the charcoal, and in half an hour the iron is melted down, and partially oxidizing, forms a cinder rich in iron. This cinder is left in when not too abundant, and the metal is worked in it and subjected to the refining proper for half an hour. Then the heat is increased, and the ball is formed and taken out, and about 1½ hours from the start is taken out, hammered, reheated, and hammered into bars for the English steel market.

This is in general the Lancashire process. The hearths now have commonly two tuyeres opposite each other, through which the blast enters at a pressure of 3.5 inches of mercury and about 220°. The charge is about 180 pounds of pig-iron, though sometimes as heavy as 290 pounds. The work goes on uninterruptedly for 6 days, with two to three men per shift with a production of 6 to 14 gross tons of blooms, a waste of 13 per cent. of the pig-iron, and the consumption of 1220 to 2064 pounds charcoal per ton.

The blooms are reheated in the Ekman reheating furnace with blast and wood, or in Siemens furnaces with the Lundin condenser for moisture in the gas from the sawdust or wet peat used. Loss of weight in heating, 9 to 12 per cent.

In the Dannemora district two hearths work together (Walloon method), one reheating the other's bloom, producing 8 to 12 gross tons per week with 4700 to 7000 pounds charcoal per ton.

In Pennsylvania a finery forge is worked with about 230 pounds in pigs laid on top of the charcoal, and the iron as melted drips down before the tuyere. When fully melted the blast is turned down upon the iron, which is also stirred with a bar. The cinder is let off frequently when soft weld-iron is desired, and the loup is squeezed with the bar to free it from cinder as much as possible. The loup is raised and forged into billets. A fire works 13 hours a day, making 6 loups, or about 1000 pounds, that is, about 3 tons per week. With *refined iron* 6 tons per week are made. About 0.9 tons charcoal and 24 cwt. of pig-iron are required to the ton of billets.

Steel made in fineries is produced by the Siegen, Styrian, and Carinthian methods, of which the Styrian is perhaps most widely practiced. Most of the cheap cutlery and mechanics' tools sold as German are made in Westphalia, or vicinity, of steel from the finery, and the Styrian *scythes*, the quality of which is highly renowned, are of steel from the Styrian finery forges. In Styria the hearth is 23 inches long, 20 broad, and 10 to 12 inches below the tuyere. It has a loam bottom, above which charcoal is stamped in. The white crystalline pig in flat cakes 2 or 3 inches thick and some finery cinder are first melted down for a bath in which to work the steel. The cinder should be greater in quantity and less rich in oxide of iron than when iron is intended. The steel from the previous heat is reheated in this bath, the new pig being allowed during the

reheating to melt and drop down before the tuyere. When the reheating is concluded, the iron will generally be found very near the proper degree of decarbonization, and the fining is then soon finished by working the metal up with a bar to expose it to the blast. The cinder is used to prevent the burning out carbon beyond proper amount, and is let out after the reheating, and perhaps once or twice more if too abundant. One heat requires about 3½ hours, and 2 fineries with 4 men make about 1200 pounds in 16 hours with the loss of 9 to 10 per cent. iron, and a consumption of charcoal of 297 to 338 pounds per 120 pounds of steel.

The process has the closest resemblance to that for iron, so that strangers can detect no difference, and the men themselves often make a lump of iron instead of steel. Not unfrequently one finery makes iron while the exactly similar one next it makes steel.

Puddling is at present the principal source of iron, the product of steel by this process being irregular in quality, and now mainly used for remelting in crucibles. For a long while after its first production in 1835 *puddled steel* was largely made, but has now been almost wholly superseded by *Bessemer steel.*

There are two kinds of puddling, viz., puddling proper, or *dry puddling* of pig-iron previously *refined*, as invented by Onions and made successful by Cort, both in 1784; and *wet puddling*, or *boiling*, as it is called, in which gray forge-iron is used without refining. Boiling makes the best iron, puddling probably the most. The distinction lies in the fact that in puddling the air acts more directly upon the iron, while in boiling the action is mainly through the cinder of silicate of protoxide of iron, which absorbs oxygen, giving it up to the carbon of the pig-iron. The great liquidity of both iron and cinder enables the impurities to separate more readily, and the iron to be purer, more uniform in composition, and freer from cinder than when puddled.

There have been many modifications of the process, the principal one of late years being a modification of the Uchatius (really Wood, 1761) steel process applied to pig-iron as it runs from the blast-furnace. Pulverized magnetic or specular ore was poured into the stream of iron, oxidizing the latter somewhat, but mainly chilling it into a mush, which, when cold, was termed *pig-bloom.* These were sweated or welded up in the heating furnace and rolled into bars. The process known as the *Ellershausen* wasted too much iron and attacked the furnace-bed too much, and has long gone out of use.

The *refinery* is a most important piece of apparatus at a works where common iron is made for rails and from forge pig specially smelted from puddling- and heating-furnace cinder with little "mine" ore, as in the Welsh works. There are two objects sought,—to remove silicon, graphite, and other elements from the iron, thereby making the iron *white*, to as great an extent as possible with reasonable waste; and by producing white iron to have a material which will be pasty as soon as melted, and require comparatively little labor and time for its conversion into weld-iron.

The modern refinery appears to have been invented in 1771 by Cockshutt, and is in general a rectangular hearth, say 40 inches wide, 60 long, and 12 to 18 deep, to contain about a ton of pig-iron. It has 3 tuyeres on each side inclining downward to the centre, and its sides and back are formed of hollow iron castings or "water-blocks," cooled by water; its bottom of sand, on solid brick-work, and the front a solid iron plate with a tap-hole. Coke is the fuel, and cold blast is used at 3 pounds per square inch. When refined, the metal is let out upon a long iron trough kept cool by water, on which it chills in plates, called *plate-metal* or *refined metal.*

The coke is thrown into the heated refinery, and on it about one ton of pig-iron with 30 pounds of hammer-scale. The metal melts in about 1½ hours under gentle blast, and after ½ hour of strong blowing with the production of considerable cinder, the metal and cinder is let out, water thrown on the cinder, and the metal separated in plates about 3 inches thick, generally honey-combed at the top. About ⅕ the iron represents weight of coke used, and 8 per cent. the waste of iron. Gray pig-iron, containing 3 per cent. silicon and 0.2 sulphur, will retain, after refining, about 0.3 per cent. silicon and 0.15 sulphur; white pig-iron, with 0.4 per cent. silicon and 2.0 per cent. sulphur, will retain about 0.1 silicon and 1.0 sulphur. Such white iron is cheap, but utterly useless without refining.

In all puddling processes the *furnace* is the same: a reverberatory furnace, with a bed about 60 inches long, 48 inches wide, covered by an arched roof 20 to 24 inches high. The roof inclines downward from the end next the fire-space, and the two sides converging also in the same direction, form with the bed a neck about 20 inches square, inclining downward to the draft-stack. The bed may be about 18 square feet, and the grate-surface 12 to 16 square feet, according to quality of coal used, and the whole construction is such as to throw the flame strongly down on the bed. The latter—originally sand—was in 1818 made of a single thickness of iron plates carefully joined, and usually cooled by air drawn through a chamber beneath them by the intense heat. The product was thus increased from 8 tons per week to 20 or 24 tons per week. All parts exposed to heat are cooled with water, and the door has a small hole through which all the work is done, the door itself being opened only to remove the balls.

In puddling, the heat is made on a bed formed on the iron bottom by melting and oxidizing scrap-iron to cinder, mixed with some cinder richest in iron from the furnace itself, and on this, when *hot*, about 500 to 600 pounds of refined iron are charged. When melted the whole soon comes into a pasty state, and is worked and stirred about by *rabbles* (iron bars). At first jets of flame are emitted like a fermentation, but afterward the iron becomes stiff, and must be broken up and exposed to the air. In about 45 minutes it begins to form metallic iron, and the whole soon comes to nature, and is carefully worked together, and then separated into 4 to 6 balls. At this stage the iron burns and the mass becomes decidedly hotter and more coherent, and absorbs the cinder formed, and the bed appears dry. The cinder is let out only once in two or more heats. In Wales 6 balls are got to a heat, and 8 heats worked in 12 hours, with a waste of 9 to 12 per cent.

In *boiling*, however, the furnace is differently prepared. On a bed, first made up like the other, ground specular ore or roasted cinder is thickly spread, and the sides are laid up thickly with the same ore or cinder, and the whole fired till it is solid, and with repairs will last a week. This material supplies a great reserve of oxidizing agents, the waste of which must be made good every day. After the cinder has been tapped off from the preceding heat, about 600 pounds of No. 3 iron or best gray forge of good quality are charged with about 120 pounds of roll scale, hammer-slag, and furnace-cinder. The furnace is carefully closed and fired hard for about 35 minutes, when the iron is melted. When partly melted it "frizzles" or simmers, and the boiler sees that no solid iron sticks to the bottom. The metal becomes covered with fluid cinder, and in about 48 minutes the bath looks as if in a full *boil*, jets of flame and metal spurting up constantly. It is kept well stirred, and in a few minutes becomes frothy, rises to the working-hole, and becomes whiter and hotter when the damper is lowered and the fire slackened somewhat. In about 65 minutes most of the iron "comes to nature," forming pasty masses in the bath of cinder, and the whole then sinks, becomes pasty, with little apparent fluid-cinder, and the boiler works the mass into 5 or more balls, with his rabble working out the cinder and patting the balls together. They seem to be in a bath of fluid-cinder, and in about 80 minutes the first ball is taken out and the rest follow at intervals of 2 minutes. While the metal is melting and the balls being taken out the furnace is kept full of somewhat smoky, reducing flame, but during the boil is kept sharply oxidizing, firing being done as lightly as possible. When the balls are out the cinder is tapped out, a little ore put in and the next heat charged. The boiler and his helper take turn about 7 times on usual forge-irons, each doing all he can. In working purer irons, like charcoal iron, the metal comes to nature in about 4 or 5 similar turns, the boiler always making the balls himself, as he is responsible and paid for good iron only. In the boiling process about ¾ to 1¼ tons of coal are required, according to quality, and owing to the ore used about as much iron is got out as is put in, the waste not exceeding 2 to 3 per cent. The product of a single furnace is about 12 tons a week on best quality iron, and of a double one about 22 tons.

The balls are taken hot as possible to a hammer or squeezer, the cinder quickly squeezed out, and the resulting longish cylinder rolled into puddle-bars about 2½ to 6 inches wide and ½ to 1 inch thick. These are nowadays the basis of all weld-iron manufacture.

In *rotary puddling*, principally by the Danks furnace, the most successful form of mechanical puddling-furnace yet introduced, the boiling process is substantially carried out as by hand. But the body or bed of the furnace being a cylinder rotating on its horizontal axis the charge is thoroughly stirred at all periods, and the ball is taken out whole, often weighing 1500 pounds. A charge of refined metal, about 1600 pounds in weight, can be puddled in 35 minutes, or a ton in 40 minutes, with a production of 50 to 85 tons per week. At Middleboro', England, 1000 pounds coal and 1000 pounds fettling (ore) were used per ton of bars with no loss of iron.

Mr. Williams, of Graff, Bennet & Co., says the Danks furnace as a worker of metals has no equal; as a melter is inferior to many; as to endurance, the shortest lived of any; as to repairs, one of the most difficult; as to quality of iron made, it has surpassed all others, standing pre-eminent; and as to product, 9 furnaces made on single turn in 37 days, or 1941 heats, 755 gross tons of bars, thus doubling the product of the puddling-furnace. Test made of the iron by the Keystone Bridge Company of a grade for bridge-work, showed an average tenacity of 67,972 pounds per square inch. A more ductile metal has been rolled thinner than 0.001 inch.

In 1850, *puddled steel* was regularly fabricated in Lippe, then in Westphalia, and soon afterward in England, all in the puddling-furnace in the same way as for wrought iron. The art essentially consists in a nice regulation of the temperature, and in arresting the process at the proper stage of decarbonization during the boil. About 450 to 500 pounds No. 3 or low No. 2 pig-iron are charged. If the iron be not manganiferous, manganese must be added in some shape to render the cinder more fluid; the amount of cinder is the same as in puddling. The pig is melted as usual, but then the temperature must be so reduced as to keep the bath in the consistency of thin cream, and the iron be well rabbled with the cinder. Boiling now takes place at a lower heat than for iron, but hot enough to enable thorough working, that the steel may be uniform. When the metal comes to nature in floating particles of steel the temperature must be lowered to yellow heat, but otherwise the operation of balling gone through with as usual. If the temperature at this stage be too high, iron results. The time occupied is about 15 to 20 minutes longer than for boiling, and the coal 1¼ to 1½ tons per ton of steel. Waste about the same as in puddling. Owing to its having so much manganese, and so little silicon, *spiegel iron* makes the best puddled steel. Of late years it has been principally used for heads of rails, and for remelting into cast steel. Much of the product of the Low Moor Works is really puddled steel of the softest grades. It is welded and wrought as iron is, but at slightly lower heat.

Chemical Composition.

	I.	II.	III.	IV.
Carbon	0.045	0.037	0.053	0.501
Silicon	0.148	0.158	0.260	0.106
Sulphur	0.002	0.003	0.064	0.002
Phosphorus	0.248	0.197	0.186	0.096
Manganese	0.020	0.019	0.029	0.144
Copper	0 056	0.011	....	....
Cobalt	0.051	0.049	....	....
Nickel	0.027	0.021	....	....
Slag and oxide of iron	2.164	2.191	0.020	....
Metallic iron	97.239	97.314	99.360	99.151
	100.000	100.000	99.972	100.000
Total iron	98.753	98.847		

I. Sir W. G. Armstrong & Co., "*Ridsdale*" iron, coil bar for gun-tube. Analyst, McCreath.

II. "*Ulster*" iron, coil bar for gun-tube; four times worked. McCreath.

III. Best neutral bar-iron from Etna Works of Spang, Chalfant & Co., Pittsburgh. McCreath.

IV. Average composition of *puddled steel* made at Ebbw Vale. Parry.

Bar-iron may be *converted* in a few hours into weld-steel by exposure at a white heat to carburetted hydrogen, or gases charged with carbon; but the only method practically followed to effect a similar conversion is that of *cementation*, a process more than 200 years old, having been described by Réaumur in 1722.

The converting oven is a large conical chimney, like that of a glass-house, containing at its base a long furnace with a high arch, under which two long chests of fire-brick slabs are placed side by side. These chests average 150 inches long by 32 wide and 36 deep. Below these chests a coal fire is placed, whose heat escapes by flues between the chests and up each side, so that the most uniform temperature may be secured for long periods. They are made as air-tight as possible. The iron bars—about ¾ inch thick by 3 inches broad and some 12 feet long—are placed at first on a bed of hard-wood charcoal (ground so as to go through a sieve of about ¼-inch mesh), on the flat and nearly touching each other, but with room for expansion in each direction. On these bars a layer of the same charcoal, ½ inch thick, is laid, then another layer of bars, another layer of charcoal, and so on till the chest is full with a charge of 8 to 9 tons, or 16 to 18 tons in the furnace. The whole is then covered with grinder's sand or swarf, in Sheffield, or clay, or loam, in a layer which must become air-tight when heated. Openings are left in the chests for removing special short test bars from time to time, but all openings are luted up tight during conversion. When ready the fire is started, and in 24 hours the chests reach a sufficient heat for cementation to take place. The heat is then kept steady for about 7 days for spring-steel, 8 days for shear-steel, and 9 to 10 days for steel for remelting in crucibles. When the trial bars show the proper "temper," all openings are closed, and very gradual cooling allowed for 4 days, when the furnace may be opened. About 27 per cent. charcoal and 80 per cent. coal are used to the steel produced; and the steel produced weighs 0.5 to 0.75 per cent. more than the iron charged.

After conversion the bars are covered with blisters of all sizes, whence the name *blister-steel*, used in the trade, and their internal structure has been entirely changed. Instead of being more or less fibrous, with bright, soft, gray color, the fracture has become very coarsely crystalline, with a dull whitish color, with great brittleness. They must be sorted by their fracture, and steel of the same "temper" kept together for subsequent use.

For the convenience of the trade six varieties have been graded and named, as follows:

No. 1.	Spring heat,	0.5	per cent. carbon.
" 2.	Country heat,	0.625	" "
" 3.	Single shear heat,	0.75	" "
" 4.	Double shear heat,	1.00	" "
" 5.	Steel through heat,	1.25	" "
" 6.	Melting heat,	1.50	" "

The spring heat shows steel round the outside of the bar, the inside having become crystalline and deadened in color. The envelope of steel gradually thickens, till in the double shear heat the fracture shows about equal parts of iron and steel, the latter rather predominating. The demarkation should be gradual, not an abrupt line. The steel through heat shows no iron, but small crystals of steel, while in the melting heat the crystals are large, often shooting across the whole thickness of the bar.

This easy method of selecting exactly the steel desired has led to the result that the highest grades of ingot or cast steel are almost exclusively made by remelting blister-steel. Sulphur is also removed by the process to a large extent, thus further improving the product.

The most probable theory of the process is that it is effected by the permeation of the iron by hydrocarbons evolved from the charcoal.

A modification of cementation, called *case-hardening*, is a valuable one. Iron forgings heated for some hours in a coating of nitrogenous matter, as horn, ferrocyanide of potassium, or leather parings. The surface of the forging becomes hard and capable of resisting great wear.

A process the reverse of cementation, although carried out in similar chests, is Tunner's process of converting cast-iron bars into steel by heating them in quartz sand with very slight access of air. It is practiced at Donawitz, in Styria. The pig-iron is Styrian white pig, from spathic iron ore, and the conversion requires 6 weeks. Four grades of steel are made,—No. 1 the hardest, No. 4 the softest. It is used for common purposes, though some of it is good enough for punches.

Ingot-Iron—Ingot-Steel.—As we have seen from the method of production, any kind of iron or steel not melted is apt to be more or less a *mush*, consisting of layers or particles of iron interlaid with cinder. For many purposes, both the cinder and the weakness of the weld along the line of cinder are great objections; but it was not till about 1760 that the problem of melting steel was solved by Huntsman at Attercliffe, near Sheffield. The Hindoo *wootz*, although melted, requires subsequent refining before use, while Huntsman's *cast steel* was ready for any application as it lay in the ingot.

For the production of ingot-iron, any *bar-iron* (weld-iron) *may be melted direct* with proper fluxes. This has been done in France. But Mushet, in 1800, while experimenting on the production of cast steel, found that if he melted iron with 0.0066 of its weight in charcoal "the resulting product occupies a kind of middle state between malleable iron and steel," and if he melted iron with only 0.005 "the quality resulting is nearly analogous to the fusion of iron *per se*, or that obtained by the fusion of iron with earths." This is the modern *homogeneous metal* at present synonymous with *ingot-iron*, and first so termed by Howell in a patent for it in 1856. The thin tubes exhibited in 1862 by Shortridge, Howell & Co. were so soft that they were mistaken for caoutchouc. By modern processes, especially the Siemens-Martin, ingot-iron may be made still softer.

Its principal sources at present are the Bessemer and Siemens-Martin processes, in which, by their easy attainment of high heat, and by means of *ferro-manganese*, with a large per cent. of manganese, iron with less than 0.1 per cent. carbon can readily be made. The Bethlehem Iron and Steel Co. have made a great deal of iron for wire drawing at Washburn & Moen Co.'s works with 0.12 to 0.14 per cent. carbon, by the Bessemer process. And the homogeneous iron boiler-plate, now so largely used, does not contain more than

0.10 to 0.18 per cent. carbon. The only difference between making these irons and the steels made by the same methods is that the decarbonization is carried further, and the recarbonization necessary to destroy oxides in the metal is effected with substances which contain as little carbon as possible. As the process is similar, and the amount of product the same in either, on iron or steel, full descriptions of methods will be given under those of ingot-steel.

We may premise that the steel known as cast steel was the only kind of ingot-steel known commercially before 1862, or in any quantity before 1866. Cast steel and German steel, both *true high steels*, comprised the whole of the material in use before those dates, while the use of any kind of *steel* on the large scale was unknown. What was not cutlery or tools was always *iron*. So rapid has been the progress of metallurgy in this branch during the last fifteen years, the most eventful known to the metallurgy of iron.

Cast steel may be made either in *pots or crucibles*, or in the Bessemer *converter*, or the Siemens-Martin *open-hearth furnace*.

The most ancient way of steel-making in pots is by *fusing compact iron with carbonaceous matter*. This is the method of the Hindoos. The production of *wootz*, the hardest variety of cast steel, is effected by fusing about 1¼ pounds of Hindoo iron with 531 grains of cassia-wood, in a small unbaked clay crucible holding about a pint. Fourteen of these closely luted are built up over a little circular pit in the ground, furnished with blast from a leathern bellows. Fuel is supplied through the top, and fusion effected in about 4 fours; 70 pots, or about 140 pounds, can be melted in a day, and the production of the district was formerly 152 cwt. annually.

This method has become the ordinary one, and since Heath's discovery of the application of manganese, in 1839, it produces all the ordinary varieties of cast or ingot steel. Huntsman's discoveries embraced a proper flux (reputed to be bottle-glass), probably the use of blister-steel, and the method of conducting the melting. The Sheffield furnaces now used are said to be identical with his. In many works, particularly on the continent of Europe, it has been customary to use *charcoal* as the carbonizing agent in the pot. But charcoal may be replaced by *spiegel iron*, or any pure *gray pig-iron* containing manganese. The impurities of the pig go over, of course, into the steel, but for common grades, where cheapness is desirable, this has been held to be no insuperable objection.

For many years a second method of *melting pig-iron in contact with substances capable of yielding oxygen* was formerly experimented with. It is very old, but was revived in 1855 as the *Uchatius* process by the Austrian general of that name. Spiegel iron, or pure white iron granulated or in small pieces, is charged in a pot with 20 per cent. roasted and powdered spathic iron ore, or corresponding quantity of other pure ore, and 4 per cent. clay, and melted in an ordinary steel furnace. The finer the granulation the softer the steel, and charcoal must be added for the harder sorts of steel. It is useful only for small quantities of very pure material, and is generally inclined to be honey-combed in the ingot. It is now unimportant in a manufacturing sense.

The third plan which has been generally followed in Sheffield for the best steel is to *remelt blister-steel assorted so as to produce the desired hardness*. The best and most uniform steel is undoubtedly attained by this method. It may be varied with advantage by using Bessemer steel of various grades. In 1839, Heath introduced the use of a *carburet of manganese*, really a compound of manganese and carbon, containing a considerable quantity of silicon, according to Henry, and found that 1 to 3 per cent. of it would yield malleable, weldable cast steel from blister-steel of low-priced British bar-iron. Before this invention only blistered Swedish or Russian bars could be used. Manganese is a correction of red shortness, so that cast steel, which could only be hammered or rolled at a low red heat, may be worked at even a welding temperature when combined with 0.2 to 0.5 per cent. The presence of more than 0.3 per cent. undoubtedly increases the brittleness of the metal when cold, and in tool-steel the less the better, on account of its tendency to cause cracking in hardening.

Mr. Seebohm gives the following estimate of the effect of these methods on crucible tool-steel with 1.0 per cent. carbon. It may be made in four ways:

A. Charging blister-steel double shear heat known to contain 1.0 per cent. carbon.

B. Charging 50 pounds unconverted iron and 8 ounces charcoal.

C. Charging 40 pounds unconverted iron and 10 pounds spiegel iron with 5 per cent. carbon.

D. Charging 34 pounds blister-steel through heat-steel of 1¼ per cent. carbon with 16 pounds mild steel scrap containing ½ per cent. carbon. The value of each method is indicated by the order of the letter after the quality stated.

Welding easiest	B	C	A	D
Combining most hardness and most elasticity when hardened	A	D	B	C
Hardest and toughest when unhardened	C	B	A	D
Soundest ingots	C	D	B	A
Least tendency to water crack in hardening	D	B	A	C

Cast steel is melted in England mostly in clay pots, and in this country mostly in plumbago pots, the greater product of the latter offsetting the cheapness of the former. The clay pots, weight about 25 pounds each, are made of 88 per cent. fire-clay, 8 per cent. old pots, and 4 per cent. coke cinders; plumbago pots are about 44 per cent. graphite, 44 of burnt clay or old pots, and 12 per cent. fresh clay. They are about 16 inches high, 8 inches wide at the middle, and taper more to the bottom than to the top. They hold about 50 pounds for the clay, or 100 pounds for the plumbago pots. Before using they are brought to red heat, and always kept so, lasting about 3 meltings. Two such pots are placed in a square furnace, about 40 inches deep, 32 inches on a side, the opening being on the floor-level, on a "stand," a circular brick resting on the grate-bars. The pots are charged with funnel-shaped charges, holding the full charge, covered with refractory covers, the furnace filled with coke or anthracite, and full draft applied. In 45 minutes the furnace is refilled with fuel, and in 45 minutes more the melter takes off the lid, and putting more or less fuel in, according to the state of fusion. The full fusion is got as the white hot fuel descends below the top of the pot,

and the metal must present a perfectly quiet, brilliant, mirror-like surface, with a little perfectly fluid slag. When thus "*dead melted*," as it is termed, the melter encases his legs in gunny-bags, wets them thoroughly, and standing immediately over the hole, pulls up the pot on the floor with a pair of tongs; a boy knocks the cover off, and the melter pours the steel into the ingot-mold. The ingot may be made of any size, but for tool-steel one about 3 inches square by 12 to 18 inches long is usual. If properly melted the ingot, with 1 per cent. carbon, will "pipe" at the top,—that is, the steel will remain fluid, so that the top can feed the bottom of the ingot, making it sound. When used the top is broken off. The pipe may extend so far down as to render the ingot useless.

The consumption of fuel is about 3½ times the weight of steel produced, and the waste about 4 per cent. in melting; 12 per cent. loss in forging, and also 12 per cent. from ends and rejected bars.

Although the product of the single pot is so small, yet a system of organization and mechanical appliances for raising the pots up and quickly transporting them to a pool, in which at least 2 pots are always pouring (so as to insure a continuous stream into the mold), enabled Krupp as early as 1862 to make castings of 25 tons weight. Since then he has made even 50-ton ingots. His method of making forgings may be briefly described as follows, with a probability of accuracy:

Krupp has 1600 pots at disposal, each holding 70 pounds of steel. The product is a soft steel with about 0.5 per cent. carbon, obtained by melting puddled or Bessemer steel with iron, special attention being paid to uniformity of grade. The ingots are made in a cast-iron mold in a casting-pit, and cast solid. The pots as they come are poured into a pool over the mold, out of the bottom of which the stream of steel falls, thus separating cinder, etc. As soon as cooled sufficiently to handle, the ingot is placed in a bed of ashes to anneal for several months, coal being thrown on occasionally to keep up the heat. Great stress is laid on this annealing as the vital part of the treatment. The ingots are then put into large furnaces, most carefully and slowly heated through, to secure uniform work, and forged under 25-ton or 50-ton hammers according to size. A large excess of metal is used, the forging losing half its weight in the lathe, counting, of course, the bore cut out by a Wahlbach drill, which leaves a core.

The writer is enabled, however, to give an account of ordnance steel manufacture at Obuchow, Imperial Russian Ordnance Works, which is authentic, having been reported by Tunner in 1871 at the instance of the Russian government. The *works* are in the form of a Latin cross of equal arms, the casting-pit at the centre with a dome roof over it. In each arm there are 20 melting-fires, 10 on a front standing back to back, each fire with 4 pots, or 320 pots available in each arm, or 1280 in the works. Each pot holds 72 pounds, or together 92,160 pounds, so that castings of 41 gross tons can be made if necessary. The *raw materials* are puddled steel from Siberian charcoal pig-iron, English coke for melting, English coal for the puddling and heating furnaces, and wood for the other operations. The puddled steel bars are sorted into 3 grades, the relative quantity of which is fixed in the charge by the grade of steel desired. No spiegel iron or bar-iron is added to the charge. In *melting* the pot is charged cold, and only used once; it is gently heated for 1½ hours and then for 3 hours with full draft, 300 pounds of coke being required to melt 100 pounds of steel. Tunner saw an ingot cast from 112 pots each of 71½ pounds; the ingot weighed 8000 pounds, and 42 men were engaged about it. The *mold* was in two halves vertically, with usual bottom plate, and a bracket upon the rim of the pit sustained the pouring-ladle or pool, which had an opening 1⅝ inch diameter at centre of its bottom, and held about a ton of steel. An equal number of fires in two opposite arms of the cross were used, consequently the pots were continually brought to each side of the pool. They were so quickly brought that 2 or 3 full ones were always waiting on each side to be taken up by two men each, emptied, and thrown away. At the pool on opposite sides stood 2 men with poles to help in pouring, and occasionally skim the steel. In pouring, the pots remaining covered were emptied through a semicircular hole. Generally 2 pots were pouring at once, sometimes only one, and once for a few seconds none, without interrupting the stream into the mold; but toward the last, when the men were tired and delayed in pulling the pots up out of the fires, the stream was twice momentarily interrupted without injury of any kind. The pouring lasted 9 minutes, at the rate of 12 to 13 pots per minute; the pool was then quickly swung away, the top of the steel covered with fine sand, then with a thin iron plate, on top of which a good deal of sand was thrown. In the case of heavy castings, where 4 or often 6 pots are pouring together, a runner is used with several arms, each emptying into the pool. The pool is also much larger, and remains closed till a good deal of steel is collected. The ingots were *forged* under a 35-ton hammer, which was found too light for guns over 9-inch calibre, and in 1871 one of 50 tons was erected. Four *specimens* for testing were taken from each forging,—outside, centre, and each end. The *tubes* for guns were *tempered in oil*, but in the Imperial Works at Perm this was not done, as it was not believed to increase the strength. When rough turned and bored, the tubes, or bodies of guns, were heated singly in a special gas-furnace, in which the tube lies between two rows of small exit flues, and is slowly heated to a uniform red heat. Withdrawn from this furnace, the tube is lifted by a crane raised high on a masonry pedestal, lowered vertically into, and kept for 5 to 8 minutes in, an iron tank of oil surrounded by water. It is then raised and lowered into an adjacent brick shaft or oven, previously well heated with wood, where it is left 24 hours to cool, with a cover over the mouth of the oven. On removal it is so warm that the hand can scarcely be held on it.

The Imperial Works at Perm went into operation in 1867; produced in two years 19 8-inch steel guns, a trial 9-inch, and several small guns, and in 1870, after the expenditure of $1,213,000, were able to produce yearly 40 steel guns of 8-inch calibre. The works were like the Obuchow works, except that the melting-furnaces were blown by fans, requiring each 250 cubic feet

of air per minute. The pots hold 63 pounds, are made of a mixture of fire-clay, old pots, and graphite, 32 per cent. each, with 4 per cent. of birch charcoal. When new they weigh 42 pounds; after drying 6 weeks at 100°, and 6 weeks more at 212°, they weigh 34 pounds, ready for use. The *raw material* is puddled steel made at the works from Siberian pig, and graded into three sorts,—first, full steel; second, steel containing some iron; third, that which when hardened still bends and is hard to break. The charge used for soft steel is 50.6 pounds hard steel, 8.8 pounds soft steel, and 2.75 pounds pure, powdered magnetic ore. The *melting* requires 5 to 6 hours in all, and for 100 pounds steel ingots 700 to 900 pounds of pine charcoal are used. Tunner saw a 4½-ton ingot cast which required 60 fires, or 180 pots in all; also 75 men at the fires, and as many more for the other work, or 150 in all. The *molds*, in two halves, are 2 to 4 inches thick, and weigh about as much as the ingots cast in them. The 4½-ton ingot was cast in 10 minutes *without* a pool, the mold being covered by an iron plate with two 8-inch holes. At each hole stood a man with a pole to aid two others, who, with pouring-tongs, lifted and emptied the pots. All movements were made on the run, and the places for the full and empty pots distinctly understood, a regular drill preceding casting.

Tunner saw an 11-ton ingot *forged* under their 16-ton hammer with steam over the piston. Under this hammer the forging of 16-ton ingots for the bodies of 9-inch guns was effected with the greatest difficulty; breakages of the tup, the piston-rod, and dies were frequent. Here, also, a 50-ton hammer was being erected.

The 11-ton ingot, a square block 31 inches on a side, and with the corners taken off, was handled by means of a *porter-bar* of iron 20 feet long by 1 foot square, on one end of which 4 clamps were fastened. Just behind the clamps was a disk like a capstan-head for bars to turn the forging, and at the far end two heavy counterweights. The clamps were heated, fitted to the ingot, and fastened to it by iron bands shrunk over them. The crane chain was slung so as to leave a preponderance to the ingot, which was raised, when required, by the weight of the workmen on the far end of the porter-bar. Some 40 men were required on the bar, 10 on the cranks, and 10 to swing the heavy hand-crane used.

The ingot was heated to a full yellow heat in 15 hours, or rather the half of its length inside the furnace. It was then forged 35 minutes, returned to the heating furnace for a wash-heat of about 2 hours, and in 40 minutes further forging, the top of the ingot was drawn out to 11 inches square, and 7 feet long. The first porter-bar is withdrawn and another fastened to the forged end of the ingot. The bottom half, which is to form the gun, is then heated for 12 hours, and forged down to an octagon to contain, inscribed, the cylinder desired. The forging is then heated for the fourth time, and drawn down to a cylindrical form carefully measured. For an 8-inch gun the forging was 20 inches in diameter by 10 feet long. The top part, 11 inches square, is now cut off under the hammer, a porter-bar fastened to the lower end of the forging (or ingot), and the free end heated for the fifth time, and forged into a cone about 7 feet long for the chase of the gun; this operation often requires a sixth heat before its satisfactory completion. The forging is at least 1½ inch greater in diameter than the finished gun.

The forging of the *rings* is followed in the same way so far as the cylinder, which is then cut up under the hammer into a number of disks of proper thickness. These are then punched, and the holes worked out over the horn of the anvil to the proper diameter. For the trunnion-bands the disks are forged elliptical, and as nearly as possible to shape while the hole is being worked out. The trunnions are afterward cut out by machine tools.

The cost of the finished guns was stated to be 75 cents per pound for 8- and 9-inch guns.

The chemical composition according to a series of analyses, unfortunately incomplete, averaged as follows:

	Pig-Iron.	Tube-Steel.	Ring-Steel.
Graphite	3.03	0.21	0.30
Combined carbon	not det'd	0.338	0.375
Silicium	0.66	0.15	0.27
Sulphur	trace	not det'd	not det'd
Copper	0.04	0.04	0.02

The steel for the *tube* or body of the gun varies as to its elastic limit from 30,000 to 40,000 pounds, with an extension of 0.8 to 1.8 per cent., and as to its ultimate tenacity from 70,000 to 85,000 pounds, with an extension at fracture of 8 to 20 per cent. The steel of the *rings* has its elastic limit between 46,000 and 54,000 pounds, with an extension of 0.14 to 0.16 per cent., while its ultimate tenacity is 80,000 to 100,000 pounds per square inch, with an extension of 6 to 10 per cent. It owes its greater strength largely to its having suffered a comparatively great amount of work under the hammer.

The rings are selected for each tube according to their respective mechanical tests, in order that they may support the tube equally and uniformly, leaving no weak portions. For a 9-inch gun, the body forged out of a 16-ton ingot, 120 tests for tenacity were executed for the proper selection of the parts.

The tube or body of this 9-inch gun weighed, when finished, 14,410 pounds; the rings, 21 in number, including trunnion-band weighed 21,615 pounds; the breech-plug on the Chambers or French system weighed 1622 pounds with the noseplate and Broadwell ring. The length of bore was 173 inches, number of grooves 32, their depth being 0.11 inch; the length of an entire revolution of the grooves was 540 inches. The weight of shot was 278 pounds, and that of the powder 47 pounds; with this charge the gun had been fired 700 times without injury or any change worth mention.

The method of hardening *mild steel in oil*, practiced at the Royal Gun-Factory, Woolwich, may be described as follows: A tube of mild cast steel is placed, perpendicularly, in a vertical furnace, upon an iron coil about 6 inches deep and an inch larger in diameter than the tube. This coil rests upon an iron plate laid on the grate-bars of the furnace, to prevent passage of air through the coil. Previous to receiving the steel the furnace has been heated to a red heat with wood, and the coil becomes filled with wood ashes. When the tube is put in its lower end is first carefully heated to a low red heat with short blocks of wood and damper nearly down. The

tube is then entirely surrounded with cord-wood, and slowly heated to a bright-red heat. At this point the damper is closed for a while, that the steel may soak or receive a uniform temperature. The more equable the temperature of the steel the straighter the block will keep and the more uniform the temper.

When the steel has reached a proper heat throughout, a traveling-crane lifts the tube out with a pair of tongs and lowers it into the oil-tank, about 20 feet deep and holding several hundred gallons. The oil-tank is cylindrical and funished with covers closing round the chain, and stands in a cylindrical water-tank sunk vertically endwise into the ground. The tube has a narrow collar turned round the top to prevent the tongs from slipping. When the red-hot tube is lowered into the tank the surface oil takes fire, but the flame is extinguished by closing the covers and covering them with canvas. A gentle stream of water kept flowing through the outer tank gradually carries off the heat of the oil, so that the tube cools uniformly in about 12 hours. The coating of charred oil round the steel retards its rate of cooling.

This operation in soft steel is really annealing, the interior metal varying little from the outer; on harder steel some noticeable hardening takes place. But in both the tenacity and ductility are greatly increased, thus rendering the steel tougher. This effect is probably caused by the removal of internal strains in the metal of the tube and its uniformity of molecular state, caused by the slow cooling in a liquid of low conducting power.

A competent metallurgist filling out this outline with his own experience will not fail of making proper steel forgings for ordnance. After an experience of more than 7 years in charge of special steel-making, during which the metallurgical problems relating to the introduction of Bessemer steel-making into this country were successfully solved, it is the conviction of the writer that there are *no secrets in the pots of Abouchoff*, or of any other works, that amount to anything more than the satisfaction of personal vanity. Krupp offers to lend a gun for £15,000 sterling to the British or United States governments, provided either will guarantee an order to him of £2,000,000 sterling should the trial prove satisfactory. Now, if the United States will make a similar contract with its own citizens, the writer has authority for asserting that the necessary capital will be forthcoming to make the guns here in the best possible manner. An 8-inch "Krupp" breech-loader, constructed by the South Boston Foundry on the designs of the Ordnance Department, has already fired 700 rounds, 180 pounds Butler battering shot and 35 pounds hexagonal powder, without the slightest injury.

The reasons why such works have not hitherto been established in this country, are the absence of proper spirit and foresight on the part of Congress, and the consequent piddling character of orders received by the Ordnance-Foundries since the war. The establishments of Krupp and Firth owe the existence of their ordnance departments, at least, to the direct encouragement of their respective governments by the advance of capital, it is believed to Krupp, but to both by the assurance of steady work.

Analyses.

	I.	II.	III.	IV.
Combined carbon........	1.333	0.47	1.18	0.384
Graphite	0.312	....	....	....
Silicium......................	0.045	0.24	0.33	0.136
Sulphur......................	0.181	0.07	none	0.008
Phosphorus................	....	0.02	0.02	0.024
Manganese	....	0.10	trace	not det'd
Cobalt and nickel	....	....	0.12	....
Copper.......................	....	....	0.30	....
Aluminium.................	....	0.01	....	....
Arsenic......	0.037	....	....	....
Iron...........................	98.092	99.09	98.05	....
	100.000	100.00	100.00	

It is difficult to adduce reliable characteristic analyses of crucible steel, there are so few accessible. No. I. is an analysis of *wootz* by Henry. It is a red, short, brittle steel, capable of being worked only at a dark-red heat. No. II. Characteristic softest tool cast steel, except as to sulphur, which is rather high. Analyst, Dick. No. III. Analysis by Abel of a cast steel Krupp gun, which exploded on first fire. Steel is too high in carbon and silicium. No. IV. Average of 3 samples of Vicker's crucible steel axles of great toughness. McCreath.

In 1856, Mr. Bessemer communicated to the British Association a paper on the "*Manufacture of Iron and Steel without Fuel*," meaning by this title the production of iron or steel from molten pig-iron without any other fuel than the carbon, silicon, manganese, and a small part of the iron therein contained. The combustion of these elements is effected by means of air forced at a high pressure up through the molten metal from below in numerous streams, so that it may completely search and penetrate every part of the metal. The air causes a rapid increase in the temperature, the metal coming rapidly to an intense white heat. Bessemer clearly discovered the fact that malleable iron could thus be produced, but for some reason failed to make his ingots merchantable, as they were more or less unsound from honey-combing,—unworkable from oxide of iron contained in the metal. This difficulty was removed by Mushet, who, in 1856, poured spiegel iron, or a triple compound of iron, manganese, and carbon, into the malleable iron. The carbon of the spiegel removes the oxide from the metal, while most of its manganese remains behind in the steel to remove the red shortness of the latter and render it sound and workable.

The process was carried on in this country under the patents of Kelly, as well as Mushet and Bessemer, all relating to the process having now expired. But it would seem that Martien had equal claims with Kelly, both having had in mind the operation of *refining*, in which Kelly seems to have been anticipated some 300 years by the operation of *refining in the blast-furnace itself*, practiced in the Eifel Mountains.

Special machinery was invented by Bessemer for the process. The mixture of gray iron is melted in a cupola, the spiegel iron preferably in a cupola. The gray iron is then run into a large, nearly spherical *vessel* or *converter*, which can be rotated on trunnions, and has an opening below for the *tuyere box* and another large opening or *nose* at the top for the emission of the gases. The blast passing through one of the trunnions, may be supplied to the converter in any position of the latter, and going down from that trunnion through a pipe into the tuyere box, it enters the

interior through 8 to 15 tuyeres, each with 12 holes about ⅝ inch diameter,—that is, an area of about 2.0 to 3.0 square inches per ton of metal, and at a pressure of 15 to 28 pounds per square inch. The metal is poured into the *belly* of the vessel while horizontal, the blast is let on to protect the tuyeres and tuyere box, and the vessel is rotated into the vertical position by a rack driven by a hydraulic cylinder at 300 pounds pressure, meshing into a pinion keyed on to that trunnion, through which the blast does not enter; range of rotation usually about 260°. After the *blowing* has continued long enough, the *spiegel* is run in and the contents of the converter emptied into a large pouring-ladle, which is supported on a hydraulic crane, so as to be readily raised, lowered, and swung around from the vessel to the ingot-molds, which are ranged in a circle round the casting-pit. When the ladle comes over the first ingot-mold a *stopper* is lifted from the fire-brick *nozzle*, in which it fits, and a stream of steel is let out. The stopper is keyed on an iron rod covered with loam, which, curving over the side, runs down through the steel, and at the front is held in a frame, which is raised and lowered by a lever. After pouring, the cinder that remains in the ladle is got rid of by rotating the ladle (by gearing on its trunnions) upside down, when the cinder runs out. The ladles are lined with a mixture of sand and loam.

In the English type of plant the casting-pit is deep and contracted, and the cranes are self-contained, the leverage afforded the ram being so short as to make the crane weak and expensive. In the American type of plant introduced by Holley, he has added to the details of the English a ladle to collect molten iron before conversion, a platform round the converters, and the crane-rams are guided in the roof as well as below. Both types are expensive, and a third has been designed by the writer with the view of cheapness and still further handiness of work, one of which is now being erected at Pittsburgh.

The *process* requires pure gray pig-iron, with about 2.5 per cent. silicon, less than 0.05 sulphur, and 0.08 phosphorus, and 0.05 copper, and advantageously with 1.0 per cent. of manganese. If more manganese be present the flame is obscured, and if the iron be too gray, the conversion lasts too long; 6 tons of steel should be converted in 14 to 20 minutes. In the course of blowing three *periods* are easily distinguished. The *first*, in a blow of 15 minutes, on hot metal, lasts about 5 minutes, and during it the graphite is converted to combined carbon, and the silicon and most of the manganese are burnt out, some of the iron being also burnt; this period is marked by an intense heat, and a weak, rather reddish flame, gradually becoming brighter. The *second* period is marked by the characteristic pasty condition of white iron, and the burning out of the carbon, as in the *boil* in a puddling-furnace. The metal froths up like soda-water, often filling the vessel and slopping over. The carbonic oxide generated carries off a great deal of heat, facilitating the conversion, just as the cooling does during the boil. The flame is very hot, full, yellow, and intensely brilliant like the sun. The third period begins at the 12th to 13th minute after the carbon has been nearly burnt out, and is marked by a transparent bluish flame and a cessation of brilliancy. Iron-smoke indicates the combustion of iron, and the heat rises rapidly. The removal of the last portions of carbon proceeds slowly; the hotter the metal is the less is the carbon acted on, and it is never wholly removed in a well-conducted blow for *steel*. This *third* period lasts 2 to 3 minutes, and the end of the blow is marked by a sudden cessation of light and dropping or drawing in of the flame, which has previously fluttered a good deal, as the carbonic oxide ceased being evolved. The heat generated is so intense as to maintain iron itself in fusion 15 or 20 minutes. About 0.1 per cent. carbon remains in the metal at the end of the blow. But as considerable oxide of iron remains in the metal at this stage, it must be removed by adding spiegel iron, usually melted, which diffuses itself through the metal, its carbon burning out the oxide with a brilliant burst of flame and the sound of boiling, heard, in a good heat, all over the shop. The steel, now ready, is poured into the ladle, running out in a milk-white, limpid stream. When *iron* is being made the blow is kept slightly longer, and the removal of oxide of iron effected by ferro-manganese,—70 per cent. manganese, 30 per cent. iron and carbon,—which is heated and thrown in lumps into the metal.

The *heat* in the metal must be kept high for successful working, and the blast strong. With very graphitic iron the writer has known blows 60 minutes long successfully made, and trials have been made with spiegel iron (8 to 10 per cent.) in which the blow lasted only 8 or 9 minutes, half the metal being thrown out by the violent frothing. A mixture averaging between Nos. 2 and 3 pig is about the best, and the waste should not exceed 12 per cent., nor the scrap-steel 3 per cent., while the ingots in good work should not be less than 85 per cent. About 0.4 to 0.5 ton of fuel is used, per ton of ingots cast, for the blowing engines and cupolas and warming vessels and ladles.

At Neuberg, an Imperial Austrian steel-works, the Bessemer steel as it comes from the converter is poured into an open-hearth Siemens furnace, where it is held in fusion at the highest heat, and *refined* by testing and supplying qualities needed. By this means the grade and quality of the steel may be very largely controlled. A metal of high quality, known as *Refined Bessemer*, is thus made there for ordnance purposes, which is very little inferior to the best pot steel.

Good steel should not rise in the ingot-mold, should throw off gas with slight effervescence while pouring, and should not form honey-comb or sponge-like surfaces anywhere except at the very top of the ingot. It is best made sound by casting it from the top into large molds holding 2 tons or more, and subjecting the metal immediately to the compressing action of a hydraulic press (Whitworth), or in ordinary work to the pressure of steam at least 100 pounds to the square inch (Jones). The fracture should be coarsely crystalline, with a mild grayish-white color and a rather fatty glance. If the color be white and the glance hard and "staring," the steel is cold short and brittle.

The gases cannot escape from low steel and iron as readily as from high steel, and in both large ingots are exposed to unsoundness or even to cracking during cooling. Whitworth states that extreme pressures like 20 tons per square inch would drive out the gas and compress the

metal to absolute soundness. Five minutes after application of pressure the ingot has shortened one-eighth of its length. After suffering 20 tons per square inch the ingots are strong and ductile as if worked, but at low pressures the ingot requires further working. To facilitate compression Whitworth casts hollow.

The *product* of American Bessemer works has been steadily increasing owing to improvements in cupolas, vessel bottoms, and refractory materials. The process became a commercial success at the Pennsylvania Steel-Works in 1869. Their steel department was built in 1867 for 3 blows, or 14 tons ingots, per day, at a cost of $600,000. In 1868 it made 8 blows, or 34 tons steel, per half-day; in 1869 they were able to make per day about 80 tons; in 1870 the greatest product was 162 tons in a day; and in 1873 in a week 180 blows, or 890 tons of ingots; in 1874 the Troy (Rensselaer) works made 972 tons ingots in a week; in 1876 the Cambria (Johnstown) works made 1475 tons per week, 6075 tons per month, and the North Chicago works 1583 tons per week, and 6457 per month, as the greatest product. Now the leading works is probably the Edgar Thomson, at Braddock's Field, and its figures, furnished by Mr. Jones, exhibit not only the wonderful results attained, but also the relations of the products of the Bessemer process.

The operations for 5 months, January 27 to June 30, 1880, are as follows:

		Gross Tons.
Total pig, spiegel, and scrap *melted*		64,619 31
Per cent. ingots yielded	85.78	55,428.75
" scrap "	3.50	2,262.08
" loss made	10.72	6,928.48
(Of the loss, 4.21 was in cupola.)		
Total ingots *bloomed*		55,782.56
Per cent. blooms produced	94.67	52,807.76
" scrap "	3.91	2,181.51
" loss made	1.42	793.29
Total blooms rolled into rails:		
Per cent. rails produced	89.02	43,272.33
" scrap "	7.57	3,678.34
" loss made.	3.41	1,656.40
Total blooms *hammered*		1,722.34
" ingots "		158.65
Total		1,880.99
Per cent. billets produced	90.85	1,708.91
" scrap "	5.69	107.00
" loss made	3.46	65.07
Quality of product:		
Per cent. first quality of rails	98.95	
" second "	1.05	
Largest product in 24 hours:		
Ingots		506.51
Rails		445.00

The effect of the process may be best shown by the following analyses of Neuberg (Styria) charcoal pig and its products:

	I.	II.	III.	IV.	V.
Graphite	3.180	....	....	....	....
Comb. carbon	0.750	2.465	0.949	0.087	0.234
Silicon	1.960	0.443	0.112	0.028	0.033
Phosphorus	0.040	0.040	0.045	0.045	0.044
Sulphur	0.018	trace	trace	trace	trace
Manganese	3.460	1.645	0.429	0.113	0.139
Copper	0.085	0.091	0.095	0.120	0.105

I., original pig; II., metal at end of first period; III., metal after the boil; IV., iron at end of blowing; V., ingot-iron or steely iron after addition of the original gray pig instead of spiegel iron.

Bessemer Steels and Irons.

	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.
Carbon	0.401	0.47	0.43	0.408	0.191	minute quantity	0.014	1.03
Silicium	0.050	trace	0.038	0.027	0.047	none	0.004	0.05
Sulphur	0.047	0.07	0.095	0.123	0.145	0.02	0.052	0.05
Phosphorus	0.004	0.06	0.178	0.117	0.145	trace	0.046	trace
Manganese	0.212	0.39	....	0.749	0.152	trace	none	0.07
Copper	0.022	0.02	....	0.373	....	....	trace	0.08
Iron	....	......	....	....	....	....	....	98.57
								99.85

VI. Good Bessemer steel rail from Ternitz. Kerpely. VII. Good Sheffield Bessemer rail. VIII. Cold short Bessemer rail, too high in phosphorus. IX. Red short Bessemer rail, too high in sulphur and copper. X. Rotten red short Bessemer (iron) rail, too high in sulphur and phosphorus, and too low in carbon and manganese to counteract the red short tendency; last three under writer's own observation. XI. Bessemer iron unusually free from all foreign constituents. Analyst, Abel, quoted by then Col. Sir Eardley Wilmot. XII. Bessemer iron, Armstrong 6-pounder, made in 1858. Riley. XIII. Tool-steel made at Graz Bessemer Works. Probiramt, Vienna.

Although the production of steel by the method of *dissolving iron in a bath of pig-iron* was described by Agricola and Biringuccio in the 16th century, yet the method progressed substantially no further till about 1860. Shortly after that date the Emperor Napoleon paid the expenses of a trial by M. Sudre of melting steel in a reverberatory furnace. Fusion was effected under a covering of bottle-glass, or blast-furnace cinder, without altering the qualities of the steel, of which 2 tons could be melted in the furnace with a notable economy of fuel. But it was not till the Siemens regenerative furnace was used by Martin, at Sireuil, in France, that the process became a success. It was largely used at first for the production of a soft ingot-iron for Chassépot barrels, just as the Springfield Armory now uses the same material from the Midvale Steel-Works. It was used till about 1872 principally as an adjunct of the Bessemer process, except at the Landore Works at Swansea, where everything was made by it. But since that date the improvement in refractory materials, and the general increase in the size of the furnaces used, have made the process an economical one everywhere, except for rails, in which it cannot compete with Bessemer steel.

The *gas-furnaces* used have an *open* hearth of the most refractory sand rammed upon cast-iron plates, cooled below by air, and covered with an

arch of Dinas or similar silica brick. The regenerative chambers are located below the hearth and below the level of the floor, two on each side, one each for gas and for air. A main flue is at each end of the furnace, communicating downward with both chambers. When at work the gases pass at their exit through two chambers, parting with their heat, which is taken up again by reversing the current so as to throw the fresh gas and air through the hot chambers. As the hot gas meets the hot air above the flue it burns with an intensely hot flame, which may be kept at will reducing, oxidizing, or neutral for long periods, thus meeting the necessities of steel melting.

The *hearths* usually have a length of 13 to 18 feet, and a width of 6.5 to 10 feet, the arch being 31 to 39 inches high at the centre. They have a door on the working side, and the steel is tapped out on the other side into a ladle, either on a crane, like the Bessemer ladle, or running along on a car over the ingots placed in a straight line. A large part of the working side of the furnace is capable of being taken down for hearth repairs, and quickly built up. In order to save the furnace as much as possible, the charges, except pig-iron, are heated in a special smaller furnace.

The *process* consists in first melting a bath of pure gray pig-iron,—the more pig being charged the more wrought scrap-iron is intended to be used. When the bath is fully melted and the hearth clean, the first iron or steel is charged about a full red heat in lots of 100 to 400 pounds. The metal is rabbled with a bar, and this process repeated till the charge is all melted. Steel is usually charged before iron scrap, and with steel alone about 10 times the weight of the pig bath can be charged. Tests are dipped with a ladle, cooled in water and broken, and spiegel iron or ferro-manganese are added, as in the Bessemer process, in kind and quantity according to the material sought, whether iron or steel. When the fracture indicates sufficient decarbonization the metal is tapped and cast.

The charge melted is seldom under 2 tons or over 15 tons. For a charge of about 6 tons the proportions would be about as follows: 2640 pounds pig-iron, 3410 pounds steel scrap, and 6864 iron scrap, with from 935 to 1265 pounds of spiegel iron added at the last. The waste by oxidation averages about 6 per cent., and the fuel used is about ton for ton. Two or three heats are made in a day, 17 per week being good work.

The purity of the steel depends on that of the pig used and that of the scrap. The latter if iron may have a serious amount of cinder in it, which is disadvantageous here, as well as in the crucible. But with proper care as to purity, and the use of the Martin process, steel very closely approaching the best crucible steel may be made in the open-hearth furnace with far greater convenience of manipulation. Of course, a number of the methods previously described may be applied in the open-hearth furnace with the view of greater cheapness, prominent among which is the *pig and ore* process, in which the pig is decarbonized by the oxygen of lumps of ore thrown in it; the iron of the ore being also reduced and adding to the product. After special experience required to keep oxygen out of the metal was attained, this process was found well suited to structural uses. With the same case as to exclusion of oxygen in the early periods of the melting, absolutely sound ingots, by the scrap process, have been made of the best grade for ordnance purposes.

By the cheap production of pig-iron rich in manganese (20 per cent.) and silicon (10 per cent.) the Terre Noire Company have been able to carry out the ideas of Schafhäutt, Bessemer, and Chernoff in regard to steel, and produce steel castings of remarkable quality. They are capable of being tempered, and thereby, it is claimed, receive without hammering the properties of wrought steel. The name "cast steel without blow-holes" is given it and the metal, and it contains from 0.26 to 0.55 per cent. silicon and 0.41 to 1.05 per cent. manganese, with 0.26 to 0.65 per cent. carbon. The steel is made in the open-hearth furnace, very much in the usual way, but with care as to the point at which the special manganese-silicon-pig is introduced. When cast the articles are tempered at a good cherry-red, with very gradual heating and careful cooling in oil. Projectiles, after tempering, show a density of 7.9, which is quite high, and is apparently due to a hardening of the steel and consequent compression.

The higher the carbon in steel the less must be the quantity of the deleterious elements, silicon, sulphur, phosphorus. The highest grade metal must be practically free from sulphur and phosphorus, and the less the quantity of all the better will all steel stand concussive or repeated shocks. Now, by diminishing the carbon the percentage of these elements may be increased without great injury to ordinary metal. Since the cheap production of ferro-manganese at Terre Noire with little carbon, these works have introduced a so-called "*phosphorus steel*," the main merit of which is the cheap conversion of old iron rails into steel rails. Where rails with 0.4 to 0.6 per cent. carbon could stand no more than 0.8 per cent. phosphorus, the phosphorus steel with less than 0.2 per cent. carbon could carry 0.2 to 0.3 per cent. phosphorus, with 0.5 to 1.0 per cent. manganese, which has an advantageous effect on the metal. This variety of steel is inferior (*v.* tests of Etna iron bars for cold shortness), and requires heavier machinery for rolling, as it cannot be worked so hot as purer metal.

Trials of various steels, at Creusot, showed that Siemens-Martin steel of the softest grade was found admirably adapted for ordnance (the trial guns being of 3 to 3.74 inches calibre), while similar iron was far too soft and extensible. The composition of both is given below, each being abnormal in the presence of so much calcium and magnesium, while normal material in other respects, except as to copper, which is high for the very best grade.

	I. Iron.	II. Steel.	III. Steel.	IV. Silicon Steel.	V. Phosphorus Iron.
Combined	Cast 612	Cast 938			
carbon......	0.155	0.338	0.364	0.875	0 120
Silicon.........	0.111	0.034	0.012	0.322	0.025
Sulphur.......	0.013	0.022	0.029	trace	0.007
Phosphorus...	0.020	0.031	0.063	0.085	0.275
Manganese....	0.108	0.089	0.302	0.772	0.072
Copper.........	0.099	0.109	none	....	....
Calcium.......	0.098	0.151	"	....	....
Magnesium..	0.038	0.022	"	....	....
Iron...........	99.458	99.204	99.275	....	....
	100.000	100.000	100.045		

Nos. I. and II. are analyses of Creusot Siemens-Martin iron and steel, given by M. Bobillier in his report "Sur l'Acier a Canons," 1873. No. III. is a sample of Nashua Iron and Steel Co. open-hearth steel, scrap-process; analyst, McCreath. IV. is so-called cast steel without blow-holes, from Terre Noire. V. is a red short ingot-iron, called at one time "Phosphorus steel," from Trenton, N. J. Its red shortness is due to presence of oxides and deficiency of manganese.

Production of Merchantable Products.—The direct products of the processes above described are not, except pig-iron, those in common use. The blooms and slabs of the bloomery, the billets and slabs of the finery, the muck bar of the puddling-furnace, and the ingot of steel, are all intermediate products requiring further work. All may be *hammered* direct into bars; but the usual course is to roll all forms of iron into flat bars about 3 to 8 inches wide, pile these on each other, weld them in a heating furnace, and roll them in powerful trains into various shapes.

For *bar-iron*, bars are used about 2½ to 4 inches wide by ⅝ inch thick, cut up into about 2 to 4 feet long, and the pile made somewhat higher than wide, with its length according to length of bar desired. For special grades of bar, the iron is thus piled and rolled into flat bars from two to three times before final piling. Iron made from bars *thrice* rolled is refined as much as possible, as further piling makes it too *dry*, or too free from cinder and difficult to weld.

The *grades* are in England, ordinary, best, best best, and best best best bars; in this country, refined, best refined, and for higher grades twice or thrice worked, or a special brand, "United States" iron, for instance, four times worked, made during the war by the Wayne Iron-Works, Pittsburgh, for musket-barrels.

For *boiler-plate*, usually twice worked, either from puddled iron (C. No. 1) or from finery charcoal slabs (C. H. No. 1), another method of piling is sometimes used, viz., *cross-piling*, in which some bars are sheared to the width of the pile, which is built of alternate lengthwise and crosswise layers, with the object of securing equal strength in both directions.

For rails the pile is usually 8 or 9 inches high by 7 to 9 inches wide, but is made of *different kinds* of bars, special bars called *tops and bottoms* being made. The top is usually some special hard, cold short iron, fresh puddled, and the bottom a tough iron for the flange as free from red shortness as may be also fresh puddled, so that each may thoroughly weld to the bars between; next these often come bars from old rails, the rest puddled iron. The Reading Railroad made iron rails with tops of thrice-rolled, the rest twice-rolled iron, about the best made in this country. This same method of piling is used for many other kinds of products, and if the article be large, like some I beams, the pile is made the shape of the finished article, but, of course, greatly larger.

The strength of the product depends on the amount of *work* upon it, the greater the reduction of the pile the stronger the bar. Not less than 6 times area of bar is required for good iron; if this is impossible, the work must be put on the bars before final rolling. Mr. Clay, of the Mersey Steel-Works, has shown the effect of *repeated working* by piling and rolling puddled bars, re-piling the bars from each rolling twelve successive times.

		Tenacity.
Original bars		43,904 pounds per square inch.
2d working		52,640 " " " "
3d "		59,584 " " " "
6th "	maximum	61,600 " " " "
9th "		60,480 " " " "
12th "		43,904 " " " "

Col. Wilmot stated that ingots of Bessemer metal exhibited the following improvement from working:

	Tenacity.
Ingot-iron ingots	41,242
Same ingots rolled to large bars	72,613
Same ingots rolled to boiler-plate	68,347
Ingot-steel ingots	68,259
Same ingots hammered or rolled	154,825

Steel is usually hammered direct for best tool-steel, or rolled direct from the ingot for other kinds. The choice between hammer or rolls depends on the quality of the raw material and that of finished product desired, the hammer making the best product from average material, the rolls the cheapest. For steel rails at the Cambria Iron-Works, large ingots (over 2 tons) are rolled in a *reversing-mill* into long bars about 7 inches square, each of which is cut up into 6 to 8 blooms for single rails. Six gross tons of steel (about one charge of the Bessemer vessel) are rolled in 15 minutes or less, and the estimated capacity of the mill is 600 tons of steel reduced from 16½ inches square (average) to 7 inches square in 24 hours. Elsewhere smaller ingots are less advantageously rolled in a *three high blooming-mill*, for 3 to 4 single rails each. Trains of rolls are spoken of as 2 high or 3 high, when two or three rolls are used. In the 3 high train the piece is rolled from back to front as well as to the back only, as in the 2 high train, thus saving the time required to pass the piece back over the top roll. A peculiar 3 high train, known as *Lauth's plate-mill*, uses a small roll opposed to a large one, the former being prevented from breaking by its rolling against the large roll above or below it. This rolls out the plate quicker than two large rolls could, for the same reason that a hammer with narrow dies draws its bars quicker than with wide dies, the latter to some degree *holding* the bar.

The essential rule of *rolling* is that the piece in every groove or pass must be free sidewise. The greater the draft of the pass, the more room must be left at the sides to secure proper extension.

This is especially the case in rolling *wire rod*, where the greatest proportional reductions between successive grooves are applied. A 1½-inch square bar, 12 feet long, is rolled in 17 passes to a rod about 0.17 inch diameter and 175 to 250 feet long in one minute, toward the last being rolled in 2 or 3 passes at once. This rod is rolled on a reel ready for the draw-bench. As an instance of the ductility of iron from the finery forge, it may be mentioned that the St. Engidy and Kindberg Iron and Steel Co. exhibited at Vienna a wire only 0.011 inch diameter in unbroken coils, each 49,310 feet long, drawn with previous rolling from a single bar.

Application of Ingot-iron and Steel.—Cast steel containing less than 0.75 per cent. carbon hardens so little as to be practically useless to the mechanical engineer. Ingot (cast) steel of *good* quality may be chosen as follows, according to percentage of carbon, the steel or iron being low in sulphur and phosphorus:

TOOLS.

Carbon.	
1.5 per cent.	Razor and best lathe tools; very easily burnt.
1.375 "	Saw-file hardness; must be worked below cherry-red.
1.25 "	Turning and planing tools and drills. With skill this grade may be welded with difficulty.
1.125 "	Mill picks, milling tools, and hot sets. Requires great care in welding.
1.00 "	Chisel grade; tough, unhardened, and welded with some difficulty.
0.875 "	Set grade; where, as in smiths' sets and farmers', the soft end of set must stand blow of a heavy hammer.
0.75 "	Die grade; where surface is required hard, the rest tough and able to stand pressure. Also for shear-blades, etc.

STRUCTURAL.

(Principally Bessemer, and Siemens-Martin steel and iron.)

0.65 per cent. (and over.)	Machinery steel for arbors, shafts, springs, etc. Hardens well, but will scarcely weld, being inferior in this respect to cast steel. May be called *very hard* steel considered structurally.
0.55 "	Springs of all kinds, saw-steel, rock-drills, etc. *Hard steel* structurally.
0.45 "	Tires, rails, connecting rods, guides, etc. *Medium hard* or *medium soft* steel. Welds badly and hardens badly.
0.35 "	Ordnance, axles, tires, rails, armor-plate, etc. Welds somewhat more easily than preceding, but hardens very imperfectly. *Soft* or *low steel.* Hardens scarcely at all; welds well.
0.25 "	Rifle-barrels, ordnance, sheet-steel, etc. Formerly called *extra soft steel*, now called *ingot-iron*, or better, *hard* ingot-iron. Does not harden at all, and welds with sand-like iron.
0.10 "	Boiler-plate, rivets, horseshoe nails, and all purposes to which best weld-iron is applicable. *Soft ingot-iron.* Becomes tougher and more ductile when "hardened," and welds readily.

TESTS OF IRON AND STEEL.—Mechanical tests, though quickly made, throw little light on the origin or composition of the metal, unless associated with *Smith* tests of its characteristics. These are tests for red shortness, for cold shortness, for ability to work and weld, for ability to harden, and for ductility, as shown by the angle to which a given bar or plate will bend with or across the grain. This information, combined with the tenacity and elastic limit of the metal, will enable an experienced person to decide very accurately as to the composition and origin of the metal, and Adamson has introduced a "color test," which will enable one to say very nearly how the metal was made. Special experience in this direction can be carried to wonderful perfection. While thorough experience in this department is essential to making reliable products, it is believed that the following notes, indicating the general methods, will afford considerable aid to intelligent criticism. Interference with the manufacturer should at all events have no further scope than an intelligible statement of the objects in view.

When one takes a bar for criticism, a cold fracture is usually the first indication sought. If the bar breaks easily *without nicking*, the metal is very hard steel, or cold short wrought iron. The latter usually shows a crystalline structure of glaring whiteness, while the crystals of the steel will be small, and its color grayish white and mild. If the bar *requires nicking*, it may be a tough, generally red short iron, an ingot-iron, or a medium steel. In this case the fracture will decide between the weld-iron and weld-steel, but not between ingot-iron and ingot-steel; these latter must be separated by their ability to harden and weld, and by ductility, represented by comparative softness under the hammer. If the bar be red short iron, its fracture will generally be of a gray silky color, more or less fibrous according to the toughness of the iron, while the ingot-iron will have a quite coarsely granular structure, gray in color for good metal, and the ingot-steel have a more finely granular structure of similar color (in each case modified by the presence of impurities). Puddled steel can be distinguished by its more or less lamellar structure and frequent presence of spots of iron darker in color than the steel. Blister-steel would be distinguished by its somewhat yellowish color, unusually coarse structure, and its blisters. The above are the usual varieties met with in construction.

The iron or steel may have been overheated and rendered coarsely crystalline with change of color, or red short iron may have been made crystalline by *vibration*, as in a car-axle, or *concussion*, as in an armor-plate. In such cases iron is weak. The origin of the metal will throw light on such exceptions.

If, on *heating* the bar, it will stand a heat so high that sparks fly from its corners on exposure to air, it may be either weld- or ingot-iron. Weld-iron or ordinary piled bars will not *work* with anything like the perfection or soundness of ingot-iron, but it will *weld* with greater soundness, on the average, because it contains cinder. The lowest rail-steel, about the softest steel in the trade, cannot be brought to full iron-welding heat without burning. Steel welds at a lower temperature the harder it is,—that is, the more carbon it contains.

In grading steel, one must bear in mind the exceedingly marked difference in *welding* ability possessed by the different grades and kinds, well exhibited in the table for selection of steel. By observing the *heat* required to weld, the facility with which the bar *welds*, and the *character* of the metal as above described, one can state very exactly the kind of steel in hand and its percentage of carbon.

The best method of ascertaining *red shortness* is that of drawing down at a high heat a flat, thin strip about ½ inch wide by ⅛ inch thick by 9 inches long. Cut it off, reheat to a full yellow, and begin by bending one end at right angles at the high heat, bending, rebending, and hammering down the strip each time on itself, like flattening down an S. Doing this slowly, about 5 bends can be made before the heat is lowered to black heat. The bends being all made at different temperatures will indicate at which, if any, the bar is red short,—that is, tears or cracks while being worked. The degree of cracking will usually indicate the amount of sulphur. If copper and silicon be present in quantity, the break will be *rotten*, and if a large percentage of manganese has been added to counteract these elements, the fatty glance and quite gray color of the cold fracture will indicate this fact.

Cold shortness is very easily determined by attempting to bend a bar about ¾ inch square. If iron, it will not bend to an angle of 90° with its original direction, and if high steel, will scarcely bend at all. The appearance of the fracture will somewhat indicate the cold shortness by the degree of whiteness. The influence of phosphorus is well shown in appended tests on excellent bar-irons, practically identical in every respect, except the amount of phosphorus. All were boiled

from Isabella forge pig, four bars containing 0.22 per cent. phosphorus and four others 0.32 per cent. phosphorus. Those with 0.22 per cent. bent cold to S shape, and were hammered down flat without injury, and three of the four did the same at a nick without breaking, but the fibres tore out to the neutral axis. All those with 0.32 per cent. broke short off at the nick, with crystalline fracture; two broke in the uninjured section before bending 153°, one at 162°, and only one bent 180°. All these tests were made *with* the fibre, and the face of welds parallel to surface bent. Bars containing over 0.65 per cent. phosphorus will not bend to 90°. While no apprehension need be felt in structural use for bars containing 0.3 per cent. phosphorus, yet nothing with over 0.2 per cent. is entitled to be considered first-class soft iron, like the "Ulster" and "Pembroke" brands.

Soft rail-steel with 0.35 to 0.5 per cent. carbon and 0.1 per cent. phosphorus is safe, if otherwise good; with 0.2 per cent., decidedly cold short and unsafe. Tool-steel with more than 0.02 phosphorus is inferior in toughness and ability to keep its edge. A test bar ¾ inch square, from a Bessemer rail, will not bend at all when it has over 0.25 per cent. phosphorus and over 0.25 carbon, and the rails therefrom will be very brittle.

As to *working* or *ductility*, which is of high importance, the smith usually determines it in a test associated with that for red shortness. If a bar about 1 inch wide by ¼ inch thick be slit at the end about an inch in, the ends bent sideways, and inside the bottom of the slit a hole be punched and enlarged till the metal breaks at the slit, the most crucial test for soundness and workability will have been performed. Only the softest ingot-irons and steels of the highest quality will suffer this treatment without tearing in any part. The very best wrought iron will permit the hole to be enlarged till the metal is black-hot, but only the very highest quality, if the bar has been slit.

Another method of ascertaining this quality is to draw down the metal, at proper heat, into the smallest square-tapered rod it will bear without splitting. The best steel will thus draw down almost as fine as a needle, and also allow this tapered point to be flattened down, at a black heat, without injury.

A further measure of ductility is given by the behavior of a small square bar bent cold into an U shape. The ingot-irons and softest steels permit this to be suddenly done with a bar ¾ inch square and the sides hammered close together without injury. Steel of ordinary quality will break, as above, with 0.6 to 0.7 carbon after bending 50°. The angle of flexure seems to be proportional to the amount of carbon, as Greiner asserts. Vickers corroborates this statement, by his tests of best crucible steel, showing that a $\frac{5}{16}$ plate with 1.25 per cent. carbon will break at 38°, while a similar plate with 0.33 per cent. carbon will bend 180° and hammered down flat.

The forge tests prescribed by the British Admiralty are prescribed on a strip 48 inches long with fibre and full width of plate across it. Bends to be made on smooth cast-iron slab with corner rounded to radius of 0.5 inch.

Hot test. All plates 1 inch thick or less must bend hot, without fracture, 125° lengthwise, 90° crosswise for first-class, and 90° lengthwise and 60° crosswise for second-class plates.

Cold test. Plates should bend cold without fracture as follows:

Thick.	1st Class or B. B.		2d Class or B.	
	Lengthwise.	Crosswise.	Lengthwise.	Crosswise.
1″	15°	5°	10°	...
¾	25	10	20	5°
½	35	15	30	10
¼	70	30	55	20
3-16 or under	90	40	75	30

The ability to *harden* is a very striking one. From time immemorial it has been *the* distinctive characteristic of steel, and is its specially valuable property. By their ability to harden the different grades may be distinguished without the least uncertainty. The fracture of two kinds *after* hardening is so different as to be astonishing, although their previous separation by color and grain may have been uncertain.

Weld-iron bars will often be made weak with disintegration of structure when heated nearly white-hot and cooled in brine, because such bars are wanting in homogeneity, containing sometimes steely particles, and always cinder. This exhibition, readily distinguished from hardening by its irregular character and inability to temper, is that property of all weld-iron which prompted Bessemer's question, "Why should it be attempted to stick dirty little granules of iron together, and then squeeze the impure mass until it is so small as to be useless until it is again fagoted up and imperfectly united, and thus forever to multiply the defects which its first treatment entails?"

Ingot-iron is distinctly separated from weld-iron by its crystalline homogeneous structure and the characteristics in hardening described in the nomenclature of this article. It will be noted that the attempt to harden ingot-iron requires the highest temperature the metal will bear. This is because each grade of steel hardens at a temperature decreasing with its percentage of carbon, the hardest steel, like the Mushet and others, obtaining its proper greatest hardness at the darkest red heat. When steel is what is termed *good* the heat at which it is hardened should not exceed low redness. The grade of steel is determined by taking a bar about ½ inch square, nicking it while cold at equal distances, and then so heating it that one end be yellow, while the other is black-hot. In this condition cool suddenly in brine, and the character of the fracture at each neck will indicate the temperature at which the steel hardens best, and consequently, in general, the grade. In the shop this test is often used before working up any new lot of steel, so as to know its proper hardening heat. The proper fracture for hardened steel is an extremely close-grained surface with conchoidal fracture, full white in hard steel, and growing grayer with slightly more open crystalline texture as the steel becomes softer.

When tungsten is present, hardened steel is often tougher than usual; chromium and titanium seem to increase the hardness.

When steel is hardened, and then reheated at

lower temperature, even far below redness, and again suddenly cooled, the original hardness is softened to a degree inversely proportionate to the temperature. The degree of hardness left in the steel is called *temper*. When the scale is taken off with a file, the metallic surface exhibits different colors.

Temperature.	Color.		Use.
	Exact.	Practical.	
430° F.	Pale yellowish.	Straw.	Lancets, razors, etc.
450 "	Pale straw.		
470 "	Full yellow.	Gold.	Penknives, turning tools, etc., where hardness is more important than elasticity.
490 "	Brown.	Chocolate.	Axes, plane-bits, etc.
510 "	Brown with purple spots.		
530 "	Purple.	Purple.	Cutlery, wood tools, etc.
550 "	Bright blue.	Violet.	Swords, cold chisels, light springs, etc.
560 "	Full blue.	Blue.	Augers, saws, stone chisels, springs, etc., where elasticity is more important than hardness.
600 "	Dark blue.		

These great differences in hardness may be applied to testing as a scale to indicate the quality of a sample by its ability to maintain toughness and uniformity of edge and grain, the readiest test being to make a flat cold chisel, temper it, and try it on hard cast iron. The greater the hardness at which it is able to hold its edge the better the steel, and the freer from cold shortness.

When a bar of *ingot-iron* or *steel* is fully heated through to a temperature of 600° (dark blue) in a bath of molten lead, the molecular cohesion of its particles seems to be lessened. When the bar is broken at that temperature, at a nick made when cold, the break will be found differing very greatly from that made cold. The closer the original grain the greater the homogeneity of the fracture, and the higher the temperature at which the steel was made the less the change which occurs in the appearance of the fracture. Cast steel of good quality scarcely changes its appearance at all. The change in Bessemer, open-hearth, and finery steels is very marked indeed, compared with the change in cast steel, each having quite a characteristic fracture. The circumstances of production being generally known, this "color test" will enable one to conclude as to the temperature and method of conducting the respective processes, the amount and influence of silicium and manganese, and hence very closely the manner and often the locality in which the specimen was made.

Another important application of this color test is the distinguishing of the metal best adapted by its chemical composition to resist percussive action between 450° and 600° F. The poorer class of metals with notable amounts of sulphur and phosphorus are simply rotten between these temperatures, although enduring considerable when cold. But it seems clear that the purer the metal is the better will it resist when heated within its elasticity, although weaker when cold than the poorer metal. Great endurance can only be attained by a pure iron as little as possible combined with other elements except carbon. Ordinary iron, though good for cables and tension rods, would be unsafe in a fowling-piece or military rifle, as by quick firing a color heat may be approximately developed, and the barrel be liable to burst. The barrel should not be allowed to become unduly hot in use, but the selection of the metal should be such as to make the endurance of accidental overheating as certain as possible. This consideration applies with force to the selection of ordnance material. The forgings should not be worked at a color heat in any case. This dangerous state frequently occurs in engine fly-wheel shafts and car-axles run dry, and steel forgings are frequently cracked in the journal by water applied to cool them quickly.

MECHANICAL PROPERTIES.

Ordinary Cast Iron.

Property.	Maximum.	Minimum.	Mean.
Tenacity, pounds	23,520	10,976	15,232
Ult. elongation, per cent	0.2	0.12	0.16
Crushing, pounds	120,512	55,328	86,240
Ult. shortening, per cent	20.0	10.0	....
Ratio tenacity to crushing	1 to 6.7	1 to 4.5	1 to 5.66
Transverse resistance, $S = \frac{l \times wt.}{4\ bd^2}$	7,840	4,816	6,104
Specific gravity	7.35	6.85	7.1

These determinations, for which we are indebted to Fairbairn and Hodgkinson, are on English irons, which do not vary much from ordinary American. The striking superiority of American charcoal iron to even the best English irons will be seen under ordnance cast iron.

Bar-Irons.

Kind.	Maximum.	Minimum.	Mean.
English "Yorkshire," like Low Moor. Tenacity, pounds	68,848	44,584	57,555
Ult. extension, per cent	28.36	9.14	20.62
Swedish; Styffe. Tenacity, pounds	53,729	43,710	45,607
Ult. extension, per cent	22.85	17.29	21.97
Salisbury "gun-bars," 1837, Johnson. Tenacity, pounds	....	....	58,009
Greatest elastic strength in *tension**	....	....	33,600
Greatest elastic strength in *compression**	....	....	26,880
Angle-iron, tenacity	59,000	42,500	....
Ult. elongation, per cent.	15.4	5.8	....
	Sp. gr.	Sp. gr.	Sp. gr.
Best rolled bars, English	7.7626	7.5333	7.6623
Angle-iron, English	7.7310	7.5297	7.6006
Forged iron shafts, English	7.6585	7.6077	7.6307
Common puddled iron, English	7.5381	7.2898	7.4276

* Hodgkinson's experiments on Conway Bridge.

The *tenacity* alone does not express the value of the iron; the elongation and reduction of area must also be considered. A very useful comparison is Poncelet's or Mallet's co-efficient, got by multiplying half the breaking weight per square inch, in pounds, by the ultimate elongation, in inches, in one foot of length. This represents the toughness of the material, or perhaps the best criterion is the ratio of the elastic limit to the tenacity.

Plates.

	Maximum.	Minimum.	Mean.
Tenacity.			
Best plates, pounds....	62,720	47,040	54,880
Ult. elongation, per cent..........	17.0	11.0	13.4
All lengthwise.			
Diminution of tenacity *across fibre* in per cent. of longitudinal tenacity..........	18.0	10.0	....
Diminution of elongation, per cent......	....	....	45.0
Ordinary plates in longitudinal tension...	61,040	36,960	....
Ult. elongation.........	13.0	3.3	8.0
Admiralty tests.	1st class. Best Best.	2d class. Best.	
Tenacity, lengthwise.	49,280	44,800	....
" crosswise...	40,320	38,080	....

These results are Kirkcaldy's. For admiralty forge-tests of plate, *v.* tests of iron and steel.

Large Forgings.—In small forgings iron or steel may be hammer-hardened and its tenacity increased. This is not the case with large forgings, which are always weaker. Mallet found results as follows:

Specimen.	Tenacity.	Ultimate Elongation.
Original bars before piling	48,056	5.5 per cent.
From forging from..........	43,680	4.3 "
Down to..........................	40,736	0.6 "
In a large forging exposed to heat and percussion six weeks....................	14,560	0.35 per cent.
Specimens from "Peacemaker." Original bars before piling................	46,950	Reduction Area. ....
Specimen from gun after bursting........................	38,595	16.6 per cent.

This was Commodore Stockton's gun, burst on board U. S. S. "Princeton," 1844. It was made by Ward & Co., from bars about 4 inches square by $8\frac{1}{2}$ feet long, drawn from blooms made on the Ausable River in the Adirondacks.

Tenacity of Ingot-Irons and Steels.

Neuberg classification (Tunner's) compared with other results.

Grade.	Neuberg—Bessemer. Number.	Per Cent. Carbon.	Mean Tenacity—Pounds.	Ultimate Elongation—Per Cent.	Vicker's Crucible Steel. Number.	Approximate Per Cent. Carbon.	Specific Gravity.	Tenacity—Pounds.	Carlsdal—Bessemer. Per Cent. Carbon.	Limit Elasticity—Pounds.	Ultimate Tenacity—Pounds.	Ultimate Elongation—Per Cent.
	18	0.05	57,390	30	...	......	......	....	......	....	....	......
7......................	17	0.12	61,981	...	...	......	......	....	......	....	....	......
	16	0.16	65,424	...	...	......	......	....	......	....	....	......
	15	0.22	68,868	25	...	......	......	....	......	....	....	......
6......................	14	0.28	73,459	...	2	0.33	7.871	68,096	......	....	....	......
	13	0.36	78,050	...	4	0.42	7.867	76,160	0.32	34,990	64,708	16.7
	12	0.42	82,641	20	5	0.48	7.855	84,000	0.40	34,310	70,472	15.2
5......................	11	0.50	91,824	...	6	0.53	"	95,200	......	....	....	......
	10	0.58	99,858	...	7	0.58	7.852*	92,960	......	....	....	......
	9	0.67	105,597	10	8	0.63	7.848	100,800	......	....	....	......
4......................	8	0.75	113,632	...	10	0.74	7.847	101,920	......	....	....	......
	7	0.83	122,814	...	12	0.84	7.840	123,200	......	....	....	......
	6	0.92	130,849	5	...	......	......	....	......	....	....	......
3......................	5	1.00	137,736	...	15	1.00	7.836	134,400	0.985	65,875	107,492	3.8
	4	1.08	146,918	...	...	......	......	....	......	....	....	......
2......................	3	1.17	154,953	...	....	......	......	....	1.19	67,933	139,916	4.1
	2	1.25	not det'd	...	20	1.25	7.823	154,560	......	....	....	......
1......................	1	1.50	" "	...	...	......	......	....	1.39	69,992	135,936	5.5
	...	......	....	....	...	......	......	....	1.85	57,640	99,842	1.75
	...	......	....	...	...	......	......	....	2.16	64,502	86,804	2.96

The Neuberg Bessemer classification was worked up by the direction of the Imperial Works at Neuberg, on specimens cut from rolled bars about one inch square. For ordinary purposes they separate the grades thus: VII., 57,390 pounds to 68,868 pounds; VI., 68,868 pounds to 80,346 pounds; V., 80,346 pounds to 103,302 pounds; IV., 103,302 pounds to 126,258 pounds; III., 126,258 pounds to 149,214 pounds. Nos. II. and I. are rarely made. The table for crucible steels was prepared by Mr. Thos. E. Vickers from steel of the River Don Works, on test bars with turned section 1 inch diameter, uniform for 14 inches. The bar marked * was slightly defective.

The Carlsdal tests were made for the Royal Railway Commission of Sweden, on rolled bars from that works, and reported by Knut Styffe. Besides corroborating the others they show how steel decreases in strength on passing 1.17 to 1.25 per cent. carbon, its maximum point of tenacity. The Carlsdal steel contained 0.023 per cent. phosphorus.

These general results may be safely taken as a guide. They were independently prepared by careful men, and are corroborated further by their agreement with the results of Seraing steel (Dürre), of Fagersta steel and iron (Kirkally), and the general published results on similar metal. It will be remembered that when specimens are tested for limit of elasticity, they give a lower tenacity (Carlsdal) than when broken at once for tenacity (Neuberg).

Effect of Hardening on Strength of Steel.

Maker.	Nature.	No. of Specimens tested.	Average Tenacity—Pounds per Square Inch.						Hardened and Temper drawn.
			As received.	After hardening in Oil at a				Hardened in Water.	
				High Heat.	Med. Heat.	Low Heat.	Not stated.		
Firth & Sons	Homogeneous steel	217	70,874	106,893	107,431	99,524	....	....	....
Cammell & Co	"	61	66,036	122,248	102,279	115,372	109,684	114,464	....
Krupp & Co	Cast steel	9	71,893	146,463	121,823	126,426	....	....	....
Whitworth & Co	Steel	2	85,568	....	107,968	....	....	....	....
Park Bros. & Co	Steel	12	119,459	....	217,417	....	....	141,856	165,506

The first four sets of tests were made at the Royal Gun-Factories, Woolwich, for ordnance. The last set was made by W. H. Shock, U.S.N., on steel for St. Louis Bridge experiments; all his specimens were from the same bar, all heated to a light cherry-red. The specimens hardened in water were tested at their maximum hardness; those tempered were drawn to a *plum-blue.*

The Woolwich specimens were short cylinders 0.5 inch diameter, and 2.0 inch long between shoulders; those of Mr. Shock were 0.62 inch diameter at the bottom of a circular notch cut in at the middle of breaking cylinder.

ORDNANCE CAST IRON.

English.

Property.	Max.	Min.	Mean.
Tenacity	34,279	9,417	23,257
Crushing strength	140,056	44,563	91,061
Transverse "	11,200	2,576	7,056
Torsional " $S=\frac{wt \times r}{d^3}$	9,773	3,705	6,056
Specific gravity	7.340	6.822	7.140

The gun-metal (iron) of the Bowling Iron Co. was 7.233, with tenacity of 27,838, and transverse strength 10,095 pounds, and from a gun-head resp. 7.233, 26,896, and 9386 pounds. These figures are mean results from the experiments on 850 samples of metal for cannon at Woolwich, 1858. The form of specimens and machine itself were exactly similar to the Wade machine and specimens of Ordnance Department, U.S.A.

The gun-iron used in the United States will be best described by referring to the trial cylinders for the first 15-inch Rodman gun cast at Fort Pitt Foundry in 1859, and for the 12.25″ Palliser rifle-casing cast in 1877 at South Boston Foundry.

Mean Results.

Property.	15″ Trial Cylinder.	12.″25 Trial Cylinder.
Density	7.2704	7.2771
Tenacity	30,899	33,875
Elastic limit	7,500	9,750
Ultimate elongation	0.00318	0.00337
Elastic "	0.00033	0.00051
Crushing strength	120,410	114,143
Elastic limit in compression	9,500	8,200
" elongation "	0.00061	0.00093
Transverse strength	8,626	11,556
Tangential "	42,908	63,184
Hardness	....	18.0 } Copper 4.16

The 15-inch trial cylinder was of Bloomfield pig-iron, while the other was of Dover and Muirkirk irons.

General Uchatius has determined the absolute and the elastic strength of Austrian gun-iron brought into *tension* by blows of a falling weight. Although the small size of the specimens probably affects the result unfavorably, they are, nevertheless, important. The specimens had the form of a cylinder with two conical ends broadening outwards, the area was 0.5 square centimetre, the length 75 millimetres, and the falling weight 1.15 kilogramme. I have added a comparison in foot-pounds.

Gun-Iron Tenacity under Shock.

Weight, 2.5353 pounds. Specimen, 0.0775 square inch area × 2.95 inches long.

Fall in Inches.	Foot-Pounds.	Blows received before Fracture.	Foot-Pounds per Square Inch.	Ratios.
28.346	5.9833	1	77.202	24
24.803	5.2353	2	67.551	21
21.261	4.4874	4	57.900	18
17.716	3.7395	8	48.250	15
14.173	2.9916	14	38.600	12
10.630	2.2437	37	28.950	9
7.086	1.4958	352	19.300	6
3.543	0.7479	2052	9.650	3
1.181	0.2484	elast. limit.	3.205	1

The toughness of gun-iron has been compared with that of ordinary cast iron by Mr. F. Alger for the South Boston Iron Company. The test was made with a 50 pound falling weight striking the centre of a bar of 4 square inches area lying on supports 20 inches apart. Both the striking and the supporting edges were rounded to ½ inch radius.

	Best Ordinary Cupola Iron.	Gun-Iron from Air Furnace.
Transverse strength	5,220	9,630
Specific gravity	7.0419	7.2916
Tenacity	15,542	33,334
Number of blows (50 foot-pounds) before fracture	9.44	463.0
Greatest number blows	18	563
Least number blows	2	358
Number of experiments	24	6

That this represents most wonderful toughness need not be enlarged upon. Some tests showed that gun-iron melted in the cupola stood 234 similar blows as the average of 5 experiments. This relation between the two kinds is partly corroborated by the test of 5 guns made at Bank Quay by Mr. Fairbairn, and proved at Woolwich in 1855. From an identical mixture the air-furnace gun withstood 33 rounds, the cupola gun only 17 rounds before bursting; the average respective densities were 7.210 and 7.081, and tenacities 28,515 and 18,100.

An inference from these facts may be that a homogeneous gun subjected to a charge which strains it to 3 times its elastic limit will endure more than 2000 rounds. But if strained to 24 times its elastic limit under shock it will burst at the first fire.

Kaiser, in his work on "Theorie der Elasticität und Festigkeit röhrenförmiger Körper," gives an important table of comparative elastic resistances of hollow cylinders. It shows the inadvisability of exceeding one calibre thickness of wall in homogeneous guns. Above 1 calibre the addition of 40.6 per cent. (1.25 cal.) to weight adds only 4.5 per cent. to the strength. He takes the following limits of elasticity:

A. Ordinary gun bronze..................	11,379 pounds.
B. Gun-iron, Mariazell, Austria...........	15,646 "
C. "Steel bronze"............................	34,136 "
D. Neuberg refined Bessemer for cannon..	35,558 "
E. Krupp steel for cannon.................	38,403 "

Types of Ordnance Metal.

Weight per Square Inch of Section.	I. Gun-Iron.		II. Coil Tube-Iron.		III. Steel.		IV. Steel.	
	Extensions in 0.″00001 Per Inch of Length.							
	Extension.	Permanent Set.	Extension.	Permanent Set.	Extension.	Permanent Set.	Extension.	Permanent Set.
1,000	5	...	0	......	0	......	1	......
2,000	14	...	0	......	0	......	3	......
3,000	19	...	0	......	5	......	6	......
4,000	24	...	0	......	10	......	10	......
5,000	28	...	0	......	*	......	16	......
6,000	31	...	0	......	20	......	20	......
7,000	36	...	0	......	*	......	21	......
8,000	43	...	50	......	30	......	26	......
9,000	50	...	50	......	34	......	30	......
10,000	53	...	*	......	*	......	33	......
11,000	58	1	100	......	35	......	40	......
12,000	63	2	*	......	40	......	40	......
15,000	82	3	100	......	50	......	43	......
18,000	101	6	150	......	62	......	55	......
21,000	128	13	150	......	78	......	66	......
24,000	161	27	200	50	86	2	75	......
26,000	191	42	200	100	88	4	86	......
30,000	283	103	250	150	110	5	105	......
31,000	318	126	*	*	*	*	118	......
32,000	.....	broke	900	750	115	5	123	......
34,000	.....	...	1,300	1,200	154	40	166	33
40,000	.....	...	2,550	2,400	918	720	333	167
50,000	.....	...	11,350	11,100	2080	1905	833	600
52,000	.....	...	29,650	broke	2220	2028	983	750
60,000	.....	...	....	......	4150	3910	1,750	1,450
66,000	.....	...	....	......	7175	6890	2,566	2,233
72,000	.....	...	....	......	......	broke	3,566	3,183
80,000	.....	...	....	......	......	......	6,033	5,550
85,000	.....	...	....	......	......	......	9,116	8,600
89,000	.....	...	....	......	......	......	19,316	broke
Ultimate tenacity................	32,000		52,632		72,000		89,000	
Elastic limit........................	11,000		23,000		24,000		33,000	
Elongation at elastic limit...	0.0005		0.0015		0.00083		0.0014	
Ultimate elongation............	0.0031		0.2965		0.1650		0.1931	
Area of fracture..................	0.9985		0.5535		0.5378		0.5324	
Specific gravity..................	7.7259		7.6861		7.8634		7.8491	
Hardness	18		8.92		....		16.25	
Ratio elastic to ultimate tenacity...........................	0.343		0.436		0.333		0.370	
Diameter specimen..............	1.377		0.″582		0.″649		0.″653	
Length between shoulders...	30.″0		1.″996		10.″0		6.″0	

I. Gun- (cast) iron. Specimen from the experimental cylinder for 12.″25 experimental ML. rifle, of which average tenacity when cast was 36,089 pounds per square inch, and specific gravity 7.2979, as average of 7 specimens from the gun-head.

II. Sample was from a bar of Ridsdale weld-iron, 3.″75 × 2.″625 × 2″, with the fibre. The averages of this iron for 4 tests are, specific gravity, 7.6660; tenacity, 53,110; elastic limit, 22,375 pounds per square inch.

III. Specimen of mild crucible steel from Bochum; averaged in 3 other tests, specific gravity, 7.8687; tenacity, 73,000; elastic limit, 24,333 pounds per square inch. A similar tube, of specific gravity 7.8945 and tenacity 88,019 pounds, cracked through from vent to muzzle in an 8-inch converted rifle at 175th round, the cast-iron casing sustaining 286 full rounds further till it burst at 456th round. At 3 feet from bottom 2 tests indicated an average of 7.8531, and 78,664 pounds for the ruptured tube.

IV. Whitworth Fluid Compressed Steel. When broken for tenacity *only* its strength was 110,000 pounds per square inch. Its mean mechanical properties are, tenacity, 86,000 pounds; elastic limit, 38,500 pounds; ultimate elongation, 0.″1750; elastic elongation, 0.″0023 per inch. Both III. and IV. were large forgings.

All figures for hardness refer to a scale in which copper is 5.

The "Prussian Ordnance Manual," edition 1877, gives determinations of the Royal Ordnance Foundry of the strength of "Krupp's Steel for Cannon," as follows: tenacity, 74,655 pounds; elastic limit, in tension, 28,440 pounds, in compression, 28,440 pounds; compressive strength, 241,740 pounds per square inch.

Internal Pressure (Pounds per Square Inch) Straining Walls to Elastic Limit at Thickness of

Materials.	Calibre.								
	0.1	0.25	0.50	0.75	1.0	1.25	1.50	1.75	2.0
	Pressures.								
A	1970	3,866	5,689	6,600	7,174	7,512	7,747	7,850	7,967
B	2675	5,307	7,820	9,070	9,864	10,334	10,658	10,790	10,952
C	5821	11,598	17,067	19,801	21,521	22,535	23,241	23,549	23,902
D	6056	12,083	17,787	20,624	22,418	23,476	24,211	24,549	24,902
E	6527	13,068	19,213	22,285	24,196	25,358	26,122	26,504	26,886

—*John B. Pearse, Manager South Boston Iron-Works.*

Iron, Angle-. Various angular forms of rolled iron, much used in bridge-construction for girders, beams, rails, etc., and for staying the flat sides of rectangular boilers.

Iron-bound Blocks. Those which are fitted with iron straps.

Iron-bound Coast. A coast where the shores are composed of rocks which mostly rise perpendicularly from the sea, and, having no anchorage near to them, are therefore dangerous for vessels.

Ironclads. The term applies to all vessels clad with iron for defense. The introduction of iron armor for the protection of ships is of very recent date. Formerly, as we find by allusions in history, there had been instances where efforts were made to protect the sides of ships by timber or hides, but these seem to have been isolated cases due to the ideas of some individual commander. With the artillery that was in use in the 15th, 16th, and 17th centuries there was no call for any aid in the defense of ships, and the term "wooden walls" conveyed the idea of an all-sufficient protection; and the correctness of the idea is sufficiently apparent when we refer to the actions of such commanders as Blake and Van Tromp being continued day after day, and being finally closed without definite result.

In the 18th century artillery had become much more formidable, but it was not until early in the 19th century that any definite shape was given to the idea of protecting the sides of a ship from the fire of an enemy; and even when it was first seriously proposed it met with great disfavor, and has had to fight its way against determined opposition and prejudice.

Thomas Gregg, of Pennsylvania, is given the credit of the first definite proposition for an ironclad vessel in 1813, but no decided step in developing the subject was taken until Mr. Stevens, of New York, made his contract with the U. S. government in 1843 for the construction of an armed vessel.

The date of this, the first decided step in the direction of armor for ships made by any government, is worthy of note, for we find that it was at about the same period of time that horizontal firing of explosive projectiles from the batteries of ships of war became general. The connection between the two circumstances is apparent, and there can be no doubt that the introduction of the shell as a projectile has caused the use of iron for armor.

The development of armor ceased at this time with the above contract for the Stevens battery, and it was not until after the Crimean war (1855) that efforts were renewed to introduce armor.

During the Crimean war a few ironclad batteries had been constructed by the French, and it was the behavior of these vessels in their ability to resist the effect of shells which induced the English and French governments to commence the construction of ironclad ships. In 1858 the work of conversion and construction was commenced in earnest, and it has been carried on unremittingly to the present day. As the capacity for defense increased, the power of offense was added to by increasing the power of the guns, and thus have arisen the wonderful fleets of ironclads that we now see on the ocean.

The different types of ironclads are so numerous that it is impossible to enumerate them in a paper of this character; they can be generally ranged under two heads, namely, as broadside and turreted vessels. The first efforts were naturally confined to the construction of broadside ironclads; the turreted vessels were of later date of construction, due to an invention of Mr. Ericsson, of which mention will be made later. The broadside ironclads will be first presented, and the rate of development during the past twenty years can be estimated by citing a few instances in the course of the application of the system. The work of developing the system was assumed by England and France alone, and after a certain point had been reached England was left alone to continue the work, carrying it to its present state. The conclusions that have been reached by her investigations and experiments have been adopted and applied by other nations, but the English ironclads are the proper citations to make in tracing the advancement of the system.

In 1858 the French built "La Gloire," and the English built the "Warrior." The "Gloire" was a wooden hull, but the "Warrior" was iron built. This error in the French construction was continued for many years, and had the effect of throwing her back in the struggle for supremacy, as the deterioration of the wood covered by iron-plating made repairs frequent, and increased expense.

The following table presents the first experiments made in the development of sea-going broadside ironclads:

Name of Ship.	Length in feet.	Beam in feet.	Displacement in tons.	Draft forward in feet and inches.	Draft aft in feet and inches.	Thickness of Armor at Water-line, in inches.
Warrior	380	58	9681	25.6	26.5	4½
Gloire	252	56	5530	23.1	27.10	4.72

The "Gloire" carried a battery of thirty-six 6-inch guns, but the "Warrior" carried a battery of ten 12-ton (9-inch) and sixteen 6½-ton (7-inch) guns, which made her much the more formidable vessel.

After the construction of these vessels the mode of procedure of the two governments was very unlike, the French plan being to build a large number of similar vessels, while the English plan is apparent in numerous vessels of dissimilar construction. Two examples are cited of a type that has been repeated very often in the French service, thus forming the chief part of her ironclad fleet.

Name of Ship.	Length in feet.	Beam in feet.	Displacement in tons.	Draft forward in feet and inches.	Draft aft in feet and inches.	Thickness of Armor at Water-line, in inches.
Flandre	259	56	5703	23.6½	26.10	5.9
Belliqueuse	230	46	3675	18.10	23.9	6

The class of the "Flandre" type is armed with eight 12-ton guns and four 7-ton guns. The class of the "Belliqueuse" type is armed with six 7-ton guns.

The following examples (taken, as are the above, from King's "Report on European Ships of War") illustrate the progress made in England in the development of ironclads of the broadside type:

Name of Ship.	Length in feet.	Beam in feet.	Displacement in tons.	Draft forward in feet and inches.	Draft aft in feet and inches.	Thickness of Armor at Water-line, in inches.
Agincourt	400	59	10,395	26.0	27 0	5½
Bellerophon	300	56	7,540	21.0	26 0	6
Iron Duke	280	54	6,034	22.0	23.0	8 to 6
Hercules	325	59	8,700	23.0	26.5	9 to 3
Nelson	280	60	7,323	24.2	24.2	9
Alexandra	325	64	9,492	26.0	26.6	12 to 8

Since the time of the completion of the "Warrior" there has taken place a great change in the way of disposing the armor, and this has been influenced by the change in the artillery, which concentrates a greater power now in a few guns than was developed in the "Warrior's" armament by a larger number of guns. The "Warrior" was armored amidships only,—that is, abreast of her battery; the ends were unprotected. In later constructions a continuous belt of armor is considered indispensable all around at the water-line, and the side-armor is carried up around the more contracted space devoted to the battery. In some cases, notably in the "Nelson" type, the broadside of the battery is left unprotected, the amount of armor that would have been placed at that place being disposed in the form of vertical bulkheads and horizontal decks forward and abaft of the battery; all the vital portions of the vessel are thus amply protected, and the battery itself is protected from a fire from directly ahead or astern.

It has always been very desirable to give the guns as much lateral train as possible, but when the guns, few in number, were concentrated in the central part of the vessel, it became the more necessary to increase this property in them. From the effort to achieve this object have arisen many of the modifications in the development of the fleet of ironclads, which account for the diversity in their construction. In some cases the forward and after iron bulkheads are curved to form bow and quarter ports, in which guns are mounted and protected even when the broadside battery is unprotected. In other cases, where the broadside battery is protected, and the side-armor is connected with the athwartship bulkheads forward and abaft the battery, a port is cut in the bulkheads near the corners, and the forward and after guns on each side are made "shifting guns," to fire out of either port at will. In other cases, an additional iron casemate is constructed above the main battery. In other cases, the fire ahead and astern is delivered from stationary turrets placed at the bow and stern, the guns being uncovered, mounted in barbette. By these means an all-around fire is obtained from broadside ships without interfering with the use of the whole battery on the broadside.

The introduction of turreted ironclads is due to a call for ironclads made by the U. S. government during the war of the Rebellion of 1861. Among those who responded to this call was Mr. John Ericsson, of New York, who submitted the plans of the "Monitor."

Agreeably to the conditions named by the Navy Department, the following problem was presented to him: an ironclad vessel of small dimensions capable of navigating the Southern rivers, and absolutely impregnable against the ordnance possessed by the Southern States.

The draft of water being thus limited to about 11 feet, impregnability could only be insured by nearly immersing the hull, as high freeboard and impregnability would have called for an amount of weight incompatible with light draft and small tonnage.

Absolute protection to guns and guns' crews being also an imperative condition, called for the adoption of a covered battery, which was made cylindrical, and, in order to obviate the necessity of manœuvring the vessel in narrow rivers, the battery or turret was made to revolve around a vertical axis, in order to insure an all-around fire while the vessel remained stationary.

As the light draft of this small ironclad brought the top of the propeller very near the water-line, a projecting deck, or stern-overhang,

was adopted for the protection of the propeller-blades.

The principal object of the "Monitor" being that of engaging shore-batteries at short ranges, facilities for dropping and lifting the anchor without exposing the crew also presented a problem for solution, hence the adoption of the overhang-deck at the bow, provided with a cylindrical well in which the anchor was suspended after being lifted by mechanism arranged within the hull. In order to give thorough protection, the steam machinery, as well as the quarters for officers and men, were located below the water-line, and further protected by a continuous side-overhang. This consisted of the armor and wood backing, first styled "armor timber," which was bolted to the iron hull, being supported by a horizontal girder running all along the side, called an "armor shelf," which was assisted by vertical gussets of iron secured at intervals to the side by angle-irons. The wood backing was disposed in two layers between these gussets, and the armor, consisting of five 1-inch plates, was bolted on outside of all. The armor shelf, disposed as a horizontal girder, formed the base of this projection from the side, and presented a very formidable resistance to any inclination or tendency to roll that might be induced by the action of the waves. The whole structure was like a raft on the water, and this was the original design as conceived by the inventor. It was a most perfect gunnery platform. The guns that were mounted on this vessel had to be inclosed, and the most convenient form of inclosure was circular; this was arranged so as to give lateral training to the guns by revolving, and thus we have the origin of the system of revolving turrets for ironclad vessels.

The principle of the Ericsson turret, with modifications in the plan of revolving it, has been adopted by other nations, notably by England, and is perpetuated in her large fleet of turreted vessels, but a decided departure is taken in their construction from the original design of the "Monitor." In fact, it is a misnomer to style all turreted vessels monitors, for they are only such in the one point of common resemblance, that the battery is inclosed in a turret. With the heavy guns now in use a turret is necessary for the manipulation of them, but in the "Monitor" the turret was adopted as a convenience, for the guns that were mounted in the "Monitor" (11-inch Dahlgrens) could be worked by man-power. The turret was not the only principle involved in the "Monitor:" the low freeboard was quite as essential a feature; thus the foreign turreted vessels, with their high freeboards and breastworks and curved bottoms, inducing and favoring the rolling motion, do not embody the idea of the "Monitor."

By common, tacit consent of nations, turreted vessels are not supplied with masts and sails. The experiment was tried in England, where were built the "Monarch" and the "Captain"; both of these vessels had comparatively high freeboards, that of the "Monarch" being 8 feet in height. The "Monarch" has not been duplicated, and the "Captain" capsized under sail and foundered during her first experimental cruise. The effort in these vessels was to raise the turret-ports higher above the water; this was done by raising all the weights and building up the armored sides to the required height. The effect of this plan was demonstrated in the melancholy catastrophe that befell the "Captain." The same result, so far as raising the ports higher is concerned, is achieved now by the English Admiralty in their turreted vessels of later date by building, on a deck of low freeboard, a breastwork which protects the lower portions of the turrets and smoke-stacks, and affords a shelter to the hatchways from water that may come on deck. The breastwork-turreted vessels carry two turrets, and the space inclosed by the breastworks occupies a large portion of the length of the vessel, consequently this provides a large surface to resist the wash of seas that find their way over the rail on to the deck, and thus a rolling motion is induced which does not obtain in the Ericsson monitor. The rail itself of the breastwork-turreted vessels is much higher than in the monitor as designed, and every inch of height of freeboard increases this tendency to roll to a great degree.

There is one point about the breastwork-turreted vessel which is referred to as a great advantage, but which is more imaginary than real; it is that the breastwork affords a protection to the hatchways, which can be left open when the seas are flowing across the deck, and thus allows natural ventilation to the ship. Carefully-prepared statistics, gathered from the experience of the Ericsson monitors during the war of the Rebellion, show that the health of the crews of the monitors was better than that of the crews of the rest of the blockading squadrons. The artificial ventilation of the monitors, effected by centrifugal suction-blowers operated by steam, is thus proved to be all-sufficient.

In comparing the original design of the "Monitor" with the turreted vessels of other nations, we find that for harbor defense the monitor is the more steady gunnery platform, but for service at sea the breastwork-turreted vessel is the more efficient.

Besides England, the only nations in Europe that have adopted the turret system to any extent are Holland and Italy. The Russian navy is provided with a few monitors of the "Passaic" class. The following tables present examples of turreted vessels in the navies of the three nations who have adopted the system in whole or in part.

The fighting force of the Dutch navy is composed entirely of turreted vessels. They are designed for harbor defense, and are considered of sufficient power to cope with such vessels of an enemy as have light draft sufficient to enable them to approach a shallow coast.

Name of Ship.	Length in feet.	Beam in feet.	Battery.	Draft forward in feet and inches.	Draft aft in feet and inches.	Thickness of Armor at Water-line, in inches.
Cerberus......	187	44	Two 12-ton guns	8.6	8.6	5½
Scorpion......	193	36	Two 9-inch guns	15.6	15.6	6
Buffel.........	205	40	Two 9-inch guns	15.6	15.6	8¼
Prince Hendrik.........	230	44	Four 9-inch guns	17.10	18.10	5¾

The following are examples taken from the list of English turreted vessels:

Name of Ship.	Length in feet.	Beam in feet.	Displacement in tons.	Draft forward in feet and inches.	Draft aft in feet and inches.	Thickness of Armor at Water-line, in inches.
Viper	160	32	1,220	10.8	11.7½	4½
Scorpion	224	42	2,777	16.11	16.2	4½
Gorgon	225	45	3,430	16.5	16.5	10 to 6
Glatton	245	54	4,912	19.0	19.0	14 to 12
Ajax	260	66	8,492	23.0	24.0	18
Thunderer	285	62	9,190	26.2	26.3	14 to 12
Inflexible	320	75	11,500	23.3	25.4	24 to 16

The broadside ironclads of Italy are armored with iron of from 4½ to 6 inches, but in the development of the turret system they have taken a step in advance of the rest of the world. The following table cites the latest efforts of Italy in this respect:

Name of Ship.	Length in feet.	Beam in feet.	Displacement in tons.	Draft forward in feet and inches.	Draft aft in feet and inches.	Thickness of Armor at Water-line, in inches.
Duilio	340	65	10,650	25.5	26.5	22
Dandolo	340	65	10,650	25.5	26.5	22
Italia	400	74	13,480	25.4	30.4	36
Lepanto	400	74	13,480	25.4	30.4	36

These vessels are armed with four 100-ton Armstrong guns. The central portion of these vessels is plated with steel instead of iron, in consequence of the result of experiments made with the 100-ton gun against targets constructed on different systems of steel and iron.

In reference to the weight of the guns that can be carried by vessels of the broadside and turreted systems, respectively, it is shown that it has not been attempted to work a heavier piece than a 25-ton gun in a broadside battery, while we see that the armament of the "Duilio" (turreted vessel) consists of 100-ton guns. So far, then, as capacity to manipulate the heavier gun is concerned, the turreted vessel has the advantage over broadside ironclads.

The necessity of providing ironclad vessels with capacity to float the increased weight due to their armor has forced great changes in naval architecture. The V-shaped cross-section of the "Warrior" has given place to one of a U form, and a comparison of the dimensions of the lightly-armored "Warrior" with the heavily-armored "Alexandra" show the modifications that have been introduced in this respect. The graceful overhanging bows have been suppressed, and the sterns are designed so as to afford protection to the screw and rudder.

So great is the thickness of plates that have now been called into use in consequence of the development of power in guns, that efforts are being made to utilize other metals than iron in hope of reducing the weight of the armor while retaining power of resistance to impact. It has been mentioned above that steel is being used for the plates of the Italian turreted vessels, and it has also been discovered that an iron plate faced with steel, by welding when the steel is in a liquid state, increases the power of resistance to a great degree. It is probable that the latter plan will be very generally adopted for the armor of ironclads.—*E. Simpson*, *Commodore U.S.N.*

Iron Garters. A cant word for leg-irons.

Iron-horse. The horse of the fore-sheet or boom-sheet traveler.

Iron-rust Cement. A cement sometimes used in soft-patching boilers; it is composed of iron borings or filings, sal-ammoniac, and white lead, with sometimes a little sulphur, the object being to form a solid rust.

Irons. The wedge-shaped tools used by calkers. The fetters used to confine a prisoner. A ship is *in irons* when, owing to her bad working qualities or to mismanagement, she, in the operation of tacking, comes up head to the wind, and loses her way, lying dead in the water. If she gathers sternway she may be made to fall off the right way by shifting the helm; the long ships of the present day very seldom go around without getting sternway on. To fill the sails on the same tack, the mainsail and spanker are taken in, the after-yards are squared, and, if necessary, the head-yards are braced abox.

Iron-sick. The condition of vessels when the iron-work becomes loose in the timbers from corrosion by gallic acid.

Ironsides. A sobriquet for a favorite veteran man-of-war. The famous frigate "Constitution" was familiarly known as "Old Ironsides."

Iron Vessel. A vessel in which the keel, stem and stern-posts, keelsons, frames, stringers, deck-beams, stanchions, knees, stern and breast-hooks, bulkheads, fastenings, etc., and the outside covering or skin, are of iron. The lower masts are frequently made of iron, and sometimes other heavy spars. The decks are of wood, or sheathed with wood; some parts of the interior are ceiled with the same material, and some light bulkheads and "joiner-work" are also of wood. In some iron vessels of war the bottom of the hull is covered outside the iron skin with wooden planking, which is sheathed with copper to a short distance above the load water-line. This is done to protect the iron and prevent fouling of the bottom by grass, barnacles, etc. Vessels having iron frames and the outer skin made of planks bolted directly to the frames without the intervention of an iron skin are called *composite.* This method is advocated for parts of unarmored vessels of war that are exposed to shot, in order to avoid the well-known evil effects of shot passing through thin iron plates. Iron vessels are lighter, stronger, and far more durable than wooden ones, which they are rapidly superseding.

The principal cause of deterioration of iron vessels is the corrosion of inaccessible parts of the interior; but if these parts are thoroughly covered with asphalt, paint, or cement while building, corrosion does not occur to a serious extent. It is necessary to prevent all contact of copper with the iron.

Iron-work. A general name for all pieces of

iron, of whatever figure or size, which are used in the construction and equipment of ships.

Irradiation (Lat. *irradiare*, to cast forth beams upon). The apparent enlargement of the disk of a heavenly body, caused by the vivid impression of its light on the eye. This phenomenon is perhaps best illustrated by the appearance of the new moon; the slender, bright crescent appears to the eye to be a portion of a larger circle than the part of the disk which is visible in the shade. The effect of irradiation on the apparent diameter of the sun may amount to as much as 6″, but so small a quantity as this is of no practical importance. It may, however, be removed by observing both limbs.

Islands. An island is a tract of land surrounded by water. From this definition are, however, excluded the great continents, Eastern and Western, and Australia. The seas of the globe are dotted with islands, and their number is legion. An islet is a diminutive island, and a still smaller spot at the surface of the sea is known as a reef. For the most part islands are collected together in *groups*, and large collections of islands in one locality give it the name of archipelago, a name originally applied to the *chief sea* of the Greeks, full of islands. We have also the Farsan and Dhalæ Archipelagoes in the Red Sea, the Low Archipelago in the Pacific, and the Mahe Archipelago in the Indian Ocean. An abundance of islands has given a name to a certain quarter of the globe,—Polynesia, "many islands." The least number of islands is found in the Black Sea, of all the large sheets of water, there being no more than half a dozen small islands in it near the coast of Turkey. The Dead Sea has no islands, but most inland sheets of water have several.

Many islands are volcanic in origin, whole groups in the Pacific being formed on the craters of extinct volcanoes, and on many, active volcanoes exist, as in the well-known Lipari Islands. Others have been thrown up by earthquakes, and many have disappeared in like convulsions. Other islands have been formed, or their size increased, by the alluvium brought down by rivers, or by the drifting sands brought by ocean currents in shallow waters. Numbers of islands owe their origin to the labors of marine animals, the coral islands of the Pacific embracing nearly all of the groups. Such islands are *atolls*, with circular lagoons in their centres, *barrier reefs* or *fringing reefs*, the former gradually sinking, the latter rising from the surface of the water. Many islands have been artificially made—as on the coast of Holland—by the formation of canals. The great rivers of the world contain many islands, some of considerable size. On many islands are situated cities of greater or less size, notably New York, London, Edinburgh, Dublin, Venice, Palermo, Aden, Bombay, Yeddo, Hong-Kong, etc. By far the greater part of the islands of the world are inhabited, and at least two of the great kingdoms of the world, Great Britain and Japan, are island empires. The largest island in the world is Borneo, containing 260,000 square miles, while Nova Zembla, Iceland, Great Britain, Ireland, Corsica, Sardinia, Sicily, Ceylon, Sumatra, Java, Luzon, Celebes, Mindanao, Hainan, Formosa, Kiu-Siu, Nippon, Yesso, Saghalien, Papua, Tasmania, New Zealand, Vancouver's, Tierra del Fuego, Marajo, Hayti, Cuba, Newfoundland, and Madagascar are among the largest in the world. Many islands are remarkable for their products, some for fisheries, as Newfoundland; some for seals and walrus, as the Aleutian Islands; for cotton, as the islands on the southern coast of the United States; for coral, as Corsica; for pearls, as the Bahrein Islands, in the Persian Gulf, and the Pearl Islands, in the Caribbean Sea; for fertilizing phosphates, as the Guano and Chincha Islands, on the Peruvian coasts, and for many other valuable products.

The Atlantic contains few islands in mid-ocean. The Madeira, Azores, Bermuda, Ascension, St. Helena, St. Paul's, Martin Vaz, and Tristan d'Acunha are the principal ones. But near its shores are situated many of the more important islands of the globe. The Mediterranean contains many large and important islands scattered about its basin. The Arctic Ocean contains many islands, some of them being of great size, but few are found in the Antarctic waters. The Indian Ocean contains several large islands, and many important groups. The Pacific Ocean contains by far the larger portion of the islands of the globe, both in size and number. Many of its large islands have been enumerated. Chief among its groups are the Kiu-Shiu, Japan, Loochoo, Aleutian, Sandwich, Galapagos, Paumoto, Marquesas, Society, Friendly, Cook's, Austral, Fiji, Samoan, Union, Ellice, Phœnix, Gilbert, Marshall, Caroline, Ladrone, Philippine, Celebes, Moluccas, Kermadac and Chatham, and New Caledonia and New Hebrides.

Islands are important to the navigator, forming a haven in storms and shipwreck, being important stations for supplies, often serving as bases for light-houses, and centres for maritime operations in war. They will prove important as coaling stations for future steam fleets, even when otherwise useless.—*F. S. Bassett, Lieutenant U.S.N.*

Island Harbor. One which is protected from the violence of the sea by one or more islands or islets screening its mouth.

Island of Ice. A name given to a great quantity of ice collected into one solid mass and floating upon the sea; they are often met with on the coast of Spitzbergen, to the great danger of the shipping employed in the Greenland fishery.

Islands of the Blessed. According to an old Greek myth, certain happy isles in the Western Ocean where the favorites of the gods, rescued from death, dwelt in joy.

Isle of Wight Parson (*Eng.*). A cormorant.

Islet, or Islot. An insular spot smaller than an island, yet larger than a key.

Isthmus. A narrow neck of land which joins a peninsula to its continent, or two islands together, or two peninsulas, without reference to size. The Isthmus of Suez alone prevents Africa from being an island, as that of Darien connects North and South America.

Italy, Navy of. This kingdom was never able to boast of a very large navy until the abolition of the Austrian power in Lombardy and the removal of the territorial rule of the Pope expanded the monarchy of Sardinia to the sovereignty of all Italy. A considerable maritime force is now maintained and is still on the increase. At the end of December, 1879, it consisted of 86 steamers,

armed with 676 guns, 16 of which vessels were armor-clad. Two of the first-class ironclads alone had 7500 horse-power each, and carried four 100-ton guns. Moreover, they were double-turreted and considered the most powerful types of men-of-war ever constructed. Yet two more ironclads are on the stocks, and they will each be of 14,000 tons, carrying guns and horse-power in proportion. In 1879 the Italian navy was manned by 11,200 sailors and 660 engineers and workingmen, with 1271 officers, including 1 admiral, 2 vice- and 10 rear-admirals, and 83 captains. The marine-service is comprised in 2 regiments of 205 officers and 2700 soldiers.

Iurram. A Gaelic word signifying a boat-song, intended to regulate the stroke of the oars. Also, a song sung during any kind of work.

Ivigar. A name for the sea-urchin, *Echinus marinus*.

Ivory Gull, or Snow-bird. The *Larus eburneus* of Arctic seas. It has a yellowish beak, jet-black legs, and plumage of a dazzling white.

J.

Jab. A peculiar net used in catching the fry of the coal-fish.

Jack. A flag corresponding in appearance to the union of the national flag. Thus, in our service it is a blue flag containing a star for each State. It is hoisted at the jack-staff shipped at the bowsprit-cap when in port, with topgallant yards across. An athwartship bar of iron at the topgallant mast-head, to give spread to the royal shrouds. A popular name for a sailor. A young male pike. A portable machine for moving great weights or resistances slowly or through a small space, by human force exerted rapidly or through a great space. Its principle of action may be either that of a lever, a rack and pinion, a screw, or a hydraulic press.

Jack Afloat. A popular name for a sailor.

Jackass. A heavy rough boat used in Newfoundland. A canvas bag stuffed with oakum, used for making the hawse-holes water-tight when the chains are bent.

Jackass Frigate. A vessel between a frigate and a sloop-of-war, carrying a whole tier of guns on a covered deck and a few on the quarter-deck and forecastle.

Jackass Penguin. A name given to the penguin on account of its stupidity, and its peculiar cry somewhat resembling the braying of an ass.

Jack-block. A block under the eyes of the rigging for the topgallant or royal yard-rope, used in sending the light masts and yards up and down. It obviates the necessity of reeving or unreeving the yard-rope during the operation.

Jack Cross-trees. An athwartship iron bar at the topgallant mast-head, to give spread to the royal shrouds. It is usually called a *jack*.

Jackee-ja. A Greenland canoe.

Jacket. A close-fitting outer garment extending downward to the hips. An envelope or covering of heat non-conducting properties, used to prevent radiation of heat from a body, such as a steam-boiler, cylinder, chimney, etc. An annular space surrounding the cylinder of a steam-engine containing live-steam or hot gases, to prevent initial condensation when working steam expansively. A casing used to confine separate parts of material together.

Jack-hern. A name for the heron.

Jacking. Taking the skin off a seal.

Jack in the Basket. A sort of wooden cap or basket on the top of a pole, to mark a sand-bank or hidden danger.

Jack in the Box. A very handy engine, consisting of a large wooden male screw turning in a female one, which forms the upper part of a strong wooden box, shaped like the frustum of a pyramid. It is used by means of levers passing through holes in it as a press in packing, and for other purposes.

Jack-knife. A horn-handled clasp-knife with a laniard, worn by seamen.

Jack Nasty-face. A cook's assistant.

Jack of Dover. An old sea-dish, the composition of which is now lost.

Jack O' Lantern. The *corpo santo*, or St. Elmo's light, is sometimes so called.

Jack-o'-the-dust. The assistant of the paymaster's yeoman.

Jack-pins (*Eng.*). A name applied to the fife-rail pins.

Jack's Alive. A once popular seaport dance.

Jack-shark. A common sobriquet of the *Squalus* tribe.

Jack-sharp. A small fresh-water fish, otherwise known as *prickly-back*.

Jack's Quarter-deck. The topgallant forecastle.

Jack-staff. A short staff raised at the bowsprit-cap, upon which the jack is hoisted.

Jackstay. A rope or rod of iron running along a mast, yard, the water-ways, etc., and serving as a traveler, as a means of attaching a sail to its yard, etc.

Jack Tar. A popular name for a sailor.

Jacob's Ladder. The assemblages of shakes and short fractures, rising one above another, in a defective spar. Also, a short ladder with wooden rungs and rope sides for getting into the lower rigging, or up to the jack.

Jacob's Staff, or Cross-staff. A mathematical instrument to take altitudes, consisting of a brass circle, divided into four equal parts by two lines cutting each other in the centre; at each extremity of either line is fixed a sight perpendicularly over the lines, with holes below each slit for the better discovery of distant objects. The cross is mounted on a staff or stand for use. Sometimes, instead of four sights, there are eight.

Jaculator. A fish whose chief sustenance is

flies, which it secures by shooting a drop of water at them from its mouth.

Jag. To notch an edge irregularly.

JAGGED. A term applied to denticulated edges, as in jagged bolts to prevent their coming out.

Jagara, or Joggaree. A coarse brown sugar of India.

Jalias. Small craft on the Arracan and Pegu coasts.

Jam. To confine by pressing against; to render immovable. Generally applied to running-gear when it will not render through the blocks. Figuratively, to involve in a difficulty from which there is no escape.

Jamaica Discipline. The buccaneer regulations respecting prize shares, requiring that all prizes be divided among the captors.

Jangada. A sort of fishing float, or rather raft, composed of three or four long pieces of wood lashed together, used on the coasts of Peru and Brazil. The owner is called a *jangadeira*, but the term is evidently an application of *jergado* (which see).

Jangar. A kind of pontoon constructed of two boats with a platform laid across them; used by the natives in the East Indies to convey horses, cattle, etc., across rivers.

Janissary. A term derived from *jeni cheri*, meaning *new soldiers*, in the Turkish service.

Jarganee. A term for small worms on the sea-shore, used as bait.

Jason. A Thessalian prince, son of Æson, who, with Medea's help, brought away the golden fleece from Colchis.

Java Pot. A kind of sponge of the species *Alcyonum*.

Javels. An old term for dirty, idle fellows, wandering about quays and docks.

Jaws. Anything resembling the jaws of an animal; the points of the jaws are called *horns*. The inner end of a gaff. The space in a block in which the sheave revolves. One of the adjustable opposing parts of a holding implement, as the jaws of a vise or wrench.

JAW-BREAKERS. Long and infrequent words.

JAWING-TACKLE. The organs of speech. *Clap a stopper on your jawing-tackle*, stop talking.

JAWING-TACKS. When a person speaks with vociferous fluency, he is said to have hauled his jawing-tacks on board.

JAW-ME-DOWN. An arrogant, overbearing, and unsound loud arguer.

JAW-ROPE. A line attached to the horns of the jaws to prevent the gaff from coming off the mast. It is usually furnished with bull's eyes (perforated balls) to make it shift easily up or down the mast.

Jayls. The cracks and fissures of timbers in seasoning.

Jeers. A heavy purchase for swaying up and lowering the fore- or main-yard.

JEER-BITTS. Those to which the jeers are fastened and belayed.

JEER-BLOCKS. Twofold or threefold blocks, through which the jeer-falls are rove to hoist and lower the main- and fore-yards.

JEER-CAPSTAN. One placed between the fore- and mainmasts, serving to stretch a rope, heave upon the jeers, etc. It was the spare capstan, and was frequently housed in by sheep-pens and fowl-racks.

JEER-FALL. The rope rove through the jeer-blocks, forming the purchase known as the jeers.

Jeffers, William Nicholson, Commodore U.S.N., chief of Bureau of Ordnance. Born in New Jersey. Appointed from New Jersey acting midshipman, September 25, 1840; ordered to U. S. S. "North Carolina," 74; served in brig "Washington," tender to that ship, for several winter months on coast relief of ships in distress; September, 1841, to frigate "United States," 44; served four years in that ship, and frigate "Congress," 44, on Pacific and Brazil Stations; October 10, 1845, to Naval School at Annapolis; graduated No. 4, and promoted to passed midshipman, July 11, 1846; ordered to steamer "Vixen," 3, and served through the war with Mexico; present at attack on forts of Alvarado, under Commodore Connor; at two attacks on and capture of Tabasco, under Commodore Perry; at capture of Tuspan; of Coatzocoalcos and Laguna de Terminos; covered the landing of the U. S. army at siege of Vera Cruz, and took part with others of Mosquito Fleet in the bombardment of the city of Vera Cruz, and of the castle of San Juan de Ulloa; in 1848–49, on duty at Naval School as acting master and assistant professor of mathematics; December, 1849, to October, 1850, schooner "Morris," coast survey, harbor of Galveston and Gulf of Mexico; October, 1850, to March, 1852, mail-steamer service, between New York and Aspinwall, Havana, Kingston, and New Orleans, a part of the time in command; March, 1852, to screw-sloop "Princeton," 10, as acting master; November, 1852, transferred to frigate "Macedonian," 22, as acting master; December, 1852, exploration of Isthmus of Honduras; September, 1853, to screw-sloop "Alleghany," 10, as acting master; October, 1853, transferred to sloop "Germantown," 20; 1853–54, sloop "Germantown," Brazil Squadron.

Promoted to master, June, 1854.

Commissioned as lieutenant, January, 1855; transferred to U. S. S. "Water-Witch," 3, survey of La Plata and Parana, 1855–56; presented with a sword, with gold hilt and scabbard, by her majesty the queen of Spain, for saving the schooner "Cartagenera," of 10 guns, in October, 1855 (assent of Congress, April, 1858); had an engagement with the fort at Paso de la Patria, which caused the expedition to Paraguay, under Commodore Shubrick, and extorted apology by Paraguay; 1857, preliminary survey of Isthmus of Honduras for Interoceanic Railway; 1858–59, gunnery-ship "Plymouth," 9, West Indies; January, 1859–60, screw-sloop "Brooklyn," 22, and sloop "Saratoga," 20, West Indies; surveyed Chiriqui Isthmus while attached to "Brooklyn"; when the Rebellion broke out he was on sick-leave at his home, but he at once applied for service.

He was immediately detailed to relieve Lieut. G. T. Sinclair on ordnance duty at Norfolk, but that yard having been destroyed before he could reach there, was detailed to keep the Potomac River open; April and May, 1861, command of steamer "Philadelphia," on Potomac River; May to December, 1861, frigate "Roanoke," on blockade Atlantic coast and off Charleston; engagement with batteries at Sewell's Bluff; December, 1861, command of steamer "Underwriter," Pamlico Sound; battles of Roanoke Island, Elizabeth City, and numerous skirmishes,

under Commodore Goldsborough and Commander Rowan; expedition to Currituck Sound, March, 1862, command of "Monitor," after Worden was wounded; various bombardments and battles of Drury's Bluff, under Commander John Rogers.

Commissioned as lieutenant-commander, July 16, 1862; September, 1862, ordnance duty at Philadelphia; September, 1863, to duty as inspector of ordnance, and in charge of experiments at the ordnance yard, Washington.

Commissioned as commander, March, 1865; July, 1865, to command screw-sloop "Swatara," 10, West Indies, Mediterranean, and Africa; 1865–68, under Admirals Goldsborough and Farragut; December, 1868–69, Naval Observatory; 1869–70, Board of Examiners.

Commissioned as captain, July, 1870; September 30, 1870, to duty as assistant in Bureau of Ordnance; October, 1871, to command gunnery-ship "Constellation," West Indies and coast; April 10, 1873, chief of Bureau of Ordnance, with relative rank of commodore; in 1875, introduced a system of B. L. boat howitzers of bronze and of steel; and in 1876 doubled the power of the Dahlgren M. L. 11-inch smoothbore by converting it into an 8-inch rifle; also commenced the conversion of Parrott 100-pounder to B. L. on the slotted screw principle; worked up the details of a system of breech-loading for every calibre up to 12-inch; April 10, 1877, renominated chief of Bureau of Ordnance for four years; author of "Short Methods in Navigation," 1849; "Theory and Practice of Naval Gunnery," 1850; "Marine Surveying," 1871; and of numerous pamphlets on professional subjects; editor of "Inspection and Proof of Cannon," 1864; "Ordnance Instructions for U. S. Navy," editions of 1866 and 1880.

Commissioned as commodore, February 26, 1878.

Jelba. A large coasting-boat of the Red Sea.

Jelly-fish. A common name for the *Medusæ*, soft gelatinous marine animals, belonging to the class *Acalephæ*.

Jemmy. A finical fellow. Also, a handy crow-bar or lever.

Jemmy Ducks. The ship's poulterer. A sobriquet which has universally obtained in English men-of-war.

Jenkins, Thornton A., Rear-Admiral U.S.N. Born in Virginia, and appointed midshipman from that State, November 1, 1828; attached to sloop-of-war "Natchez," West Indies, 1828–31; in boat squadron, in 1829, cruising for pirates on coast of Cuba; in sloop-of-war "Vandalia," West Indies, in 1831–33.

Passed examination for promotion to lieutenant, June 2, 1834, and awarded by the Examining Board No. 1 of the class of 82 graduates. On the coast survey, 1834–42.

Commissioned as lieutenant, December 9, 1839; served in the frigate "Congress," Brazil and Mediterranean Squadron, 1842–45, being present at the capture of the Buenos Ayrean squadron, off Montevideo, September 29, 1844; on special service in Europe in 1845–46; was executive-officer of sloop-of-war "Germantown," in Gulf of Mexico, during the Mexican war; and latter part, commanding store-ship "Relief," same squadron, 1847–48; commanded part of the forces employed in the capture of Tuspan and Tabasco; on the coast survey, 1848–52; acted as secretary of Light-House Board from 1853–58.

Commissioned as commander, September 14, 1855; commanding sloop-of-war "Preble" on Paraguay Expedition, on Brazil Station, coast of Central America, and in Gulf of Mexico, 1858–60. Present at the capture of the armed vessels "Miramon" and "Marquis of Havana," off Vera Cruz, and under the walls of that city and the Fort of St. Juan de Ulloa, during the siege and bombardment by the insurgent forces of Gen. Miramon. Charged with conveying the prizes "Miramon" and "Marquis of Havana" and transporting their crew and passengers as prisoners to New Orleans. Secretary of Light-House Board, 1861.

Commissioned as captain, July 16, 1862; commanding steam-sloop "Wachusett," on James and Potomac Rivers, 1862; being senior officer, present at repulse of the enemy at Coggin's Point, James River, and at the attack on our flotilla, off City Point, James River, August, 1862; commanded steam-sloop "Oneida," West Gulf Blockading Squadron, off Mobile, in the fall of 1862; was appointed fleet-captain and chief-of-staff of Farragut's squadron, and was present at the passage of Port Hudson, March 14, 1863 (see Farragut's Report); fought Grand Gulf batteries, March 19, 1863; Warrenton, March 21, 23, 25, and 28, 1863; Grand Gulf, March 30, 1863; on the blockade of, during the siege prior to the surrender and attack on Port Hudson, May 24, 27, and 28, 1863. Wounded on board steamer "Monongahela" in fight with enemy's batteries stationed on Madame Winchester's farm, College Point, Mississippi River, being in command of three armed vessels conveying provisions, arms, and ammunition to the army and navy operating below Port Hudson; commanding steam-sloop "Richmond," and senior naval officer in command of naval forces below, at the time of the surrender of Port Hudson, July 9, 1863; commanding division, blockading Mobile entrance, etc., from December, 1863, to battle of Mobile Bay, August 5, 1864, in which he took part, as well as the surrender of Forts Morgan, Gaines, and Powell, August 29; left in command of the Mobile Bay Division, until February, 1865; March 14, 1865, ordered to James River, remained there until after Lee surrendered to Gen. Grant.

Admiral Farragut, in his detailed report of the Mobile affair, says, "Before closing this report, there is one other officer of my squadron of whom I feel bound to speak, Capt. T. A. Jenkins, of the 'Richmond,' who was formerly my chief-of-staff, not because of his having held that position, but because he never forgets to do his duty to the government, and takes now the same interest in the fleet as when he stood in that relation to me. He is also commanding officer of the second division of my squadron, and as such, has shown ability and the most untiring zeal. He carries out the spirit of one of Lord Collingwood's best sayings,—'not to be afraid of doing too much; those who are, seldom do as much as they ought.' When in Pensacola, he spent days on the bar, placing buoys in the best position, was always looking after the interests of the service, and keeping the vessels from being detained in port one moment more than necessary. The

gallant Craven told me only the night before the action in which he lost his life, 'I regret, admiral, that I have detained you; but had it not been for Capt. Jenkins, God knows when I should have been here. When your order came I had not received an ounce of coal.' I feel that I should not be doing my duty if I did not call the attention of the Department to an officer who has performed all his various duties with so much zeal and fidelity."

Commissioned as commodore, July 25, 1866; in August, 1865, appointed chief of Bureau of Navigation and Detail, and held that position until April, 1869, when he resigned, and was ordered to duty as secretary of the Light-House Board.

Promoted to rear-admiral, August 15, 1870; ordered to command the U. S. naval forces on Asiatic Station, in December, 1871; relieved in China, December, 1873; retired, December 11, 1873; appointed by the President, March 25, 1874, commissioner to represent the Navy Department at the United States International Centennial Exhibition of 1876, at Fairmount Park, Philadelphia.

Jerbe. See JELBA.

Jeremitas. An ancient name for fire-ships.

Jergado, or Gingado. A term for a light skiff of the 16th century.

Jerkin. An old name for a coatee, or skirted jacket.

Jerome. A trading vessel of Egypt.

Jerquer (*Eng.*). A customs officer, whose duty is to examine the landwaiters' books, and check them.

JERQUING A VESSEL. A search performed by the jerquer of the customs, after a vessel is unloaded, to see that no unentered goods have been concealed.

Jersey. Fine wool, formerly called gearnsey, ganzee, or guernsey. *Jersey frocks*, woolen frocks supplied to seamen.

Jersey City. The principal city of New Jersey, on the right bank of the Hudson River, opposite New York City, from which it is 1 mile distant and in constant communication with by means of 5 large ferries running over 30 boats. The Cunard, White Star, Red Star, and Cardiff lines of ocean steamers have extensive docks in Jersey City, and it is also the terminus of the Pennsylvania, Delaware, Lackawanna and Western, New Jersey Central, Erie, New Jersey Midland, Northern New Jersey, and several smaller lines of railroads. Large manufactories of all kinds, sugar-refineries, stock-yards and ship-yards, are located here. Pop. 120,000.

Jervis, John (Earl St. Vincent). British admiral. Born January 9, 1734. Commissioned lieutenant, 1755. Promoted to rear-admiral, 1787. This officer saw much service afloat, and when a post-captain in the British navy took the islands of Guadaloupe and Martinique from the French. But the event which procured his elevation to the peerage was his signal defeat of a Spanish fleet off Cape St. Vincent. Died March 13, 1823.

Jet. A stream of fluid issuing from an orifice, as a jet of steam, a jet of water, etc.

JET-CONDENSER. The vessel in which the exhaust steam of a steam-engine is condensed by mingling with a jet or spray of cold water.

Jetsam, or Jetson (Fr. *jeter*, to throw). Goods thrown overboard, for the purpose of lightening the ship in case of extreme peril, which sink and remain under water. Goods which remain upon the surface after being cast overboard are called *flotsam*; if they are buoyed they are called *ligan*.

Jettison. A word allied to jetsam and by some considered as synonymous with it; more properly, however, it signifies the act of throwing goods overboard, or the cutting or casting away of anything appertaining to the vessel, to lighten the ship when in extreme peril. The object of a jettison being to secure the safety of the vessel and remaining cargo, the loss incurred becomes the subject of general average (which see). It is to be observed, however, that not every casting of goods overboard, cutting away of masts, etc., constitutes such a jettison as to make a case for general average. To bring the jettison within the rules governing general average it must be voluntary; the peril must be not merely great, but extreme; and it must be the price of safety to the ship and remaining cargo.

Jetty. An erection projecting into the water, of the nature of a pier, dike, or embankment, constructed of timber, earth, fascines, stone, etc., or a combination thereof. By means of jetties at the mouths of rivers and the entrance to tidal harbors, the channel may be so narrowed and the current so concentrated as to much deepen the water over the entrance bars. Numerous instances of this application of jetties exist in Europe and this country, one of the most notable of which is the recently constructed Eads jetties at the mouth of the Mississippi River.

JETTY-HEAD. The projecting part of a wharf; the front of a wharf whose side forms one of the cheeks of a dock.

Jew-balance. A Mediterranean name of the *Zygæna malleus*, or hammer-headed shark.

Jewel-block. A small block at the extreme end of the topsail and topgallant-yard, through which reeve the halliards of the topmast and topgallant studding-sails.

Jew's-harp. The shackle for joining a chain-cable to the anchor-ring.

Jib. A large triangular sail set on a head-stay. In large vessels it extends from the outer end of the jib-boom well up towards the fore topmast-head. In cutters and sloops it extends from the bowsprit towards the lower mast-head. Of the various sails enumerated below, only the jib and flying jib are in common use. Also, the arm of a crane, one end of which is jointed to the post, the other connected to the post by a tie, so that the downward pull of a suspended weight is decomposed into a tensile strain on the tie, and a compressional strain on the jib, which acts as a strut.

JIB AND STAY-SAIL JACK. A designation for a fidgety officer who harasses the watch by continually calling upon them to make, shorten, or trim sail.

JIB-BOOM. A spar rigged out through the bowsprit-cap, the heel being clamped to the bowsprit.

JIB-BOOM, FLYING. A light spar rigged out through a wythe at the end of the jib-boom.

JIB, FLYING. A sail set on a stay extending from the outer end of the flying jib-boom to the topgallant mast-head.

Jib-foresail. The stay-foresail of a sloop.

Jib-frame. The upright frame at the sides of a marine-engine, connecting the cylinder, condenser, and framing; when applied to the beam-engine it is sometimes called the *gallows-frame.*

Jib-guys. Ropes which give lateral support to the jib-boom. They lead from the outer end of the jib-boom to the ends of the whiskers, and thence to the bows where they set up.

Jib-guys, Flying. Ropes which bear the same relation to the flying jib-boom that the jib-guys do to the jib-boom. See Jib-guys.

Jib, Inner. A head-sail which is sometimes set just abaft the jib proper, which is then called the *outer jib.*

Jib-netting. A triangular net-work under the jib-boom, which is seized to the whiskers and jib-guys.

Jib-netting, Flying. A small net-work under the flying jib-boom, which is seized to the flying jib-guys.

Jib-o'-jib. A sail known only to flying kite-men, it being the outermost of the head-sails.

Jib, Outer. See Jib, Inner.

Jib, Spindle-. A jib set between the flying jib and jib-o'-jib.

Jib-stay. A stay leading from the fore top-mast-head through a sheave in the outer end of the jib-boom. In the steam-engine, the jib-stay is a portion of the jib-frame.

Jib-stay, Flying. A stay leading from the fore topgallant mast-head through a sheave in the outer end of the flying jib-boom.

Jib-topsail. A light sail set on the topmast stay of a fore-and-after.

Jib-traveler (*Obs.*). An iron ring fitted to run out and in on the jib-boom, for the purpose of bringing outwards or inwards the tack of the jib.

Jibber the Kibber. A cant term for the trick of decoying vessels on shore for plunder. A lantern is suspended from a horse's neck, and one of his fore-legs is hobbled; being driven along the beach, the irregular motion of the lantern resembles the motion of a ship's light. Seeing a light inshore, the impression is given that there is plenty of sea-room, and the ship is likely to be stranded.

Jibe. To shift over the boom of a fore-and-aft sail, with the wind aft or on the quarter.

Jiddah. A seaport town and one of the principal trading entrepôts of Arabia. Lat. 21° 28′ 3″ N.; lon. 39° 13′ E. Pop. 18,500. The harbor is good, and the imports from Abyssinia, Egypt, India, Malay Archipelago, and England are very extensive. Slaves are also imported from Zanzibar. Exports consist of coral, Egyptian cotton goods, sword-blades, matchlocks, and Oriental goods of all kinds, with dates, coffee, etc.

Jiffy. *In a jiffy*, in an instant.

Jig. The weight furnished with hooks, used in jigging (which see). To make short pulls on a rope or tackle.

Jiggamaree. A mongrel makeshift manœuvre. Any absurd attempt to substitute a bad contrivance for what the custom of the sea may be.

Jigger. A very teazing sand-flea, which penetrates and breeds under the skin of the feet, but particularly at the toes. It must be removed, or it occasions much pain. The operation is effected by a needle, and the sac which contains the brood must not be broken, or the whole foot would be infected. A light tackle used about the decks, in the tops, etc.; a handy-billy. A sail set on a jigger-mast.

Jigger-mast. A small mast stepped on the extreme after-part of small craft.

Jiggered-up. Done up; tired out.

Jigging. A mode of catching fish by dropping a weighted line with several hooks set back to back among them, and jerking it suddenly upwards; the weight is frequently cast in the form of a small fish. Also, short pulls at a tackle fall.

Jilalo. A large passage-boat of Manilla, fitted with outriggers.

Jimmals, or Jimbles. See Gimbals.

Jimmy Legs. A sobriquet for the master-at-arms.

Jingal. A kind of long heavy musket supported about the centre of its length on a pivot, carrying a ball of from a quarter to half a pound, and generally fired by a matchlock; much used in China and the Indies. It is charged by a separate chamber, dropped into the breech and keyed.

Jinny-spinner. One of the names for the cockroach.

Jobation. A private but severe lecture and reprimand.

Job Captain (*Eng.*). One who gets a temporary appointment to a ship, whose regular commander is a member of Parliament, etc.

Job-watch. A hack-watch.

Jocks. Scotch seamen.

Jog-the-loo. To work the pump-brake, or to pump briskly.

John. A name given to dried fish. See Poor John.

John Bull. The origin of this nickname is traced to a satire written in the reign of Queen Anne, by Dr. Arbuthnot, to throw ridicule on the politics of the Spanish succession. In this satire, which is usually published in Swift's works, the French are designated as Lewis Baboon, the Dutch as Nicholas Frog, etc.

John Chinaman. A popular name for the Chinese. The earliest known instance of its use is in "A letter to the Committee of Management of Drury Lane Theatre," London, 1819, p. 64.

John Company (*Eng.*). The former board of directors for East India affairs.

John Dory. A corruption of *jaune doré*, which is the color of this fish. It is one of the Scomberidæ, *Zeus faber.* John Dory was also the name of a celebrated French pirate.

Johnny Crapaud. A jocose designation of a Frenchman, or of the French nation taken collectively. In Seward's Anecdotes occurs the following account of the origin of this designation: "When the French took the city of Aras from the Spaniards, under Louis XIV., after a long and most desperate siege, it was remembered that Nostradamus had said, 'Les anciens *crapauds* prendront Sara.' (The ancient toads shall Sara take.) This line was then applied to this event in a very roundabout manner. *Sara* is *Aras* backward. By *ancient toads* were meant the French; as that nation formerly had for its armorial bearings three of those odious reptiles instead of the three flowers-de-luce which it now bears."

The grounds for the belief that three toads or three frogs were the old arms of France are very

fully set forth in Elliott's "Horæ Apocalypticæ," vol. iv. p. 64, ed. 1847.

Johnny Raw, or **Johnny Newcome.** An inexperienced youngster commencing his career; also applied to landsmen in general.

Johnny Shark. A common sobriquet of the Squalus tribe.

John-O'-Groat's Buckie (*Eng.*). A northern name for the *Cypræa pediculus*, a small shell found on the sea-coast.

John Tuck. The galley corruption of *chantuck*, or *jantook*, a Chinese viceroy, specially meaning the viceroy of Canton.

Jol. A Danish yawl.

Jolly (*Eng.*). This term is usually applied to a comely and corpulent person, but afloat it is a familiar name for a soldier. *Tame jolly*, a militia-man; *royal jolly*, a marine.

Jolly-boat (*Eng.*). A smaller boat than the cutter, but likewise clincher-built. It is generally a hack boat for small work, being about 4 feet beam to 12 feet length, with a bluff bow and very wide transom; a kind of washing-tub.

Jolly Jumpers. Sails above the moon-rakers.

Jolly Roger. A pirate's flag; a white skull in a black field.

Jones, John Paul, was the son of John Paul, and was born at Kirkcudbright, in Scotland, July 6, 1747. Went to sea as apprentice at the age of 12, voyaging to America. Made several voyages as third mate of a slaver, and at 19 was first mate, and at 21 had command of the "John," a ship in the West India trade. Afterwards traded in a vessel on his own account, and left the sea at the age of 26, adopting the name of Jones. In December, 1775, was appointed lieutenant in the navy, and ordered as first lieutenant of the "Alfred," our first flag-ship. He hoisted the first flag of the colonies afloat,—the yellow flag with the pine-tree and rattlesnake. He participated in the capture of the "New Providence" and the attack on the "Glasgow." Was made captain of the "Providence," and being chased by a squadron off New York, escaped them by good seamanship, June 13, 1776; and he afterwards made 16 prizes, some valuable. On October 10 he was named eighteenth captain, and in command of the "Alfred" and "Providence" captured a valuable armed ship and two prizes, and eluded a recapture by good seamanship. He next went to Europe in command of the "Ranger," 18, and received from the French squadron the first salute to the stars and stripes. He cruised in English waters, burning shipping at Whitehaven and spiking guns ashore, and then attempted to carry off the Earl of Selkirk, but failed. Some plate having been carried away, he gained the name of "Pirate." On the 24th of April he took the "Drake," 20 guns. Received from the French the "Duc de Duras," an old Indiaman, and sailed in her, in company with 6 other ships, naming his new vessel the "Bon Homme Richard." He had 40 guns and a mixed crew of various nationalities. The conditions under which he sailed prevented him from carrying out several projects, but on the 23d September he fell in with a Baltic fleet convoyed by the "Serapis," 44, and "Countess of Scarborough," 20. The latter was captured by one of his squadron, and Jones, in one of the most desperate fights on record, in which his own ship was so disabled as to sink soon afterwards, captured the "Serapis," a superior ship to his own. He sailed for home in the "Ariel," 20, in September, 1780; lost his masts, put back, and sailed again on the 18th December. He was launched in the "America," 74, and transferred her to the French, making a cruise as a volunteer in her. He was a prize agent in Europe in 1783, and finally, in 1787, while in Denmark, he entered the Russian navy. Hoisted his flag as rear-admiral in the "Walodomir," 26th May, 1788, but found so much jealousy and enmity towards him that he resigned in 1789. He resided in Holland and France afterwards, and was appointed commissioner to Algiers just as his death occurred, on the 18th of July, 1792, aged 45. He was brave and energetic, but violent and vain.—*F. S. Bassett, Lieutenant U. S. Navy.*

Jones, Thomas Catesby, Commodore U.S.N. Of Welsh descent. Born in 1789; died in Georgetown, D. C., May 30, 1858. Entering the navy November 22, 1805, he became lieutenant May 24, 1812, commander March 28, 1820, and captain March 11, 1829. From 1808 to 1812 he was engaged in the Gulf of Mexico, and distinguished himself in the suppression of piracy, smuggling, and the slave-trade. When the British naval expedition against New Orleans entered Lake Borgne, he, with a small flotilla, endeavored to intercept 40 British boats. Although wounded and compelled to surrender, his conduct was highly commended. In 1842 he commanded the Pacific Squadron, and having, from erroneous information as to the existence of war between the United States and Mexico, caused the governor of Monterey to surrender that place, he was for this indiscretion relieved from his command.

Jonk. See JUNK.

Joso. A small fish of the gudgeon kind.

Joule's Equivalent. The quantity of heat that will raise one pound of pure water, at the maximum density and temperature of 39.1°, one degree F.; the equivalent in work being 772 foot-pounds.

Journal. Ensigns and midshipmen are required to keep journals, which are presented monthly for the inspection of the commanding officer. In some ships this journal must be a copy of the log-book; in others, only an abstract is required. *Journal* is also the part of a revolving or oscillating portion of a machine which is supported by or runs in bearings. It may be cylindrical, conical, or spherical.

JOURNAL-BEARING. The support of the shaft or axle, composed of the brasses or boxes in a pillow-block, or that part of the engine frame intended for the purpose.

JOURNAL-BOX. The composition lining of bearings to reduce friction.

JOURNAL-BOX METAL. Usually an alloy of copper, tin, and zinc, and sometimes antimony.

Jowder. A term to denote a retail dealer in fish.

Juan-Mooar. The black-backed gull.

Jubaltare. The early English word for Gibraltar.

Judge-advocate. The person appointed to act as public prosecutor at a court-martial is designated by law as the judge-advocate. Regarded etymologically, this term is certainly a misnomer, for the subject is, in point of function, neither a judge nor an advocate. He has no

power to hear and determine cases, nor to pass sentence, and it is not his duty to plead the cause of any one. Rather is he a prosecuting recorder. While his duties are multifarious and highly important, the chief ones are to produce and lay before the court all of the evidence against the person accused, and to record with exactness, under a solemn oath, all that transpires which it is necessary for the convening and ultimate reviewing authority to know. We are probably indebted for the imposing title to a fusion of two expressions formerly applied to a higher office in Great Britain, viz., "judge-martial" and "advocate-general," and since nearly all language is arbitrary, should not seriously object. See JUDGE-ADVOCATE-GENERAL.

Usually a commissioned officer of the army or navy is appointed to this office, although civilians are eligible, and until within the last ten years were frequently thus employed. The emoluments of the office were so liberal to them that in March, 1865, Congress found it necessary to enact that "the fees for record in naval courts-martial shall not exceed in any one case $200." Instances were known where officers had temporarily resigned their positions in order to become entitled to the large fees, as citizens, when appointed judge-advocate. The practice of appointing civilians is strenuously objected to on different grounds by all writers on military law, and may now be considered obsolete. Only military persons should so act, and they should be selected for their special fitness. Simmons, a distinguished authority, speaks of the judge-advocate as "the PRIMUM MOBILE of a court-martial," and Hughes, author of "Duties of Judge-Advocates," says that fitness consists in the possession of "superior attainments and abilities as lawyers and soldiers, the qualifications of *both* professions being requisite for this specific duty." As they are called upon to act in the threefold capacity of representative of the government, recorder of the proceedings, and as the legal adviser of the court (and not unfrequently as counsel for the accused), it is necessary that they should have a correct knowledge of the fundamental principles of law in general, and a thorough special knowledge of the practice of courts-martial.

The "Regulations for the Administration of Law in the Navy" (Sec. 161) prescribe that "Judge-advocates of all naval general courts-martial, whether convened in the United States or abroad, will be appointed by the Secretary of the Navy only, who will select a competent commissioned officer to perform this important and responsible duty in each foreign fleet or squadron." The detail generally falls to the officers of the marine corps, many of whom have made military law a special study, and all of whom, prior to July 1, 1870, received an allowance of $2.50 per diem for every day necessarily employed in the duty of the court.

The first semblance of a court-martial with judge-advocate and provost-marshal in England —our prototype—was authorized by an ordinance of Parliament in 1644, during the reign of Charles I. The Earl of Essex, general of the forces, and 56 others named in the ordinance, or any 12 of them, were made commissioners to try "all such causes as belonged to military cognizance," and were empowered to appoint "a judge-advocate, a provost-marshal, and all other officers needful." The Swiss Guards, in the service of France, had a *juge*, who was a sort of judge or provost-marshal for each company, and each regiment had a superior one who presided over the others. Their duties seem to have partaken of the nature of those of both judge-advocate and provost-marshal.

Notwithstanding the antiquity of the office, its functions are so faintly described by statute that in summing them up one is obliged to resort to the less positive though equally binding authority of established usage and practice, which, as between army and navy, is in this, as in other respects already set forth, far from uniform. (See COURTS-MARTIAL.) For some reason, possibly a morbid jealousy of authority, the office of judge-advocate in the navy, though equally indispensable, is much less potential than in the army, and unless the former is familiar with and tenacious of his powers and privileges, his character as the representative of the government is apt to be dwarfed into that of clerk to the court.

While the army judge-advocate is not only the medium of communication between the appointing power and the court, but between the court and the accused, and the witnesses, and is the first person furnished with the charges, list of witnesses, and other papers bearing on the case, which he has to prepare for trial and present, the naval judge-advocate finds the president, disinterested and distant (sometimes 500 miles), in possession of them, and often enters court at 12 M. of the day appointed to get his first knowledge of what is to be done. The president then turns over to him the papers, and he asks for time to "especially instruct himself in all the circumstances," etc., as required by Regulations. A few other points of difference are worthy of note. In the army the judge-advocate has authority to alter or amend the charges, and may even substitute a new set, but in the navy, when faulty, they must be returned to the convening authority. The naval judge-advocate is sworn "to keep a true record" and to secrecy, but he of the army to secrecy only. The latter orders the attendance of prisoners, swears the witnesses, receives the reports of absent members stating cause of non-appearance, and notifies the convening officer of any changes in the court, or adjournments in certain cases; in the navy all this is done by the president.

The duties of a naval judge-advocate, as laid down by the Regulations above cited, and otherwise understood, are, when practicable, briefly as follows: "Upon being notified that a court is to convene, and furnished (?) with such papers and instructions as may be considered necessary for his guidance," he will ascertain that the accused has a true copy of the charges and specifications preferred against him, at least 24 hours before trial, also a list of the witnesses who are to appear against him; call upon him for a list of persons he may desire to testify in his behalf, and summon all that may be necessary for either prosecution or defense; inquire what facts they can establish prior to their introduction, and prepare a short analysis or plan for the conduct of the case. (See WITNESS.) Under the authority of the commanding officer of the station or vessel where the court is to convene, he sees that a suitable place is provided, and supplied with writing materials and such other articles as

may be needed for the use and comfort of the court; obtains such books of reference as may be called for; has the necessary guards and orderly detailed, and some accommodations made for spectators who may attend. He then "examines critically" the charges and specifications, and advises the court of any errors discovered; notifies the accused of any alterations which may be directed; sees that the whole is embodied in the record; and furnishes the court with a duplicate for its use. He appoints a clerk, or reporter; procures an interpreter if required; observes that the court is organized agreeably to precept, and notes each day in the record who are present or absent. He takes care that the accused has counsel if he so desires, and that he enjoys the right of challenge, and, if he declines counsel, will himself act so far as to see that he has every facility afforded him, that his rights are not infringed, and that he suffers no disadvantage through ignorance. The record must be kept in prescribed form on prescribed paper, and show most particularly that the court, judge-advocate, and all of the witnesses were duly sworn in the presence of the accused; that he was allowed every opportunity to examine witnesses; that they pronounced their testimony correct before being discharged; that he was allowed time to prepare a statement or defense in writing; that he is the person convicted and sentenced, or acquitted; and that the whole is properly authenticated by the signatures of all of the members and himself. A smooth and legible record made from the rough notes of the preceding day is to be presented and read by him to the court immediately upon convening each day, and all errors corrected without erasure or interlineation. Each case must be kept separately, and show all changes in the composition of the court, all questions and answers, motions, rulings, etc., and have all accompanying documents appended and numbered, or lettered, for reference. The proceedings of each day appear as a chapter marked "Second Day," "Third Day," and so on, and the finding and sentence must be in his own handwriting. Questions put to witnesses by others than himself, and all motions and objections by the accused are written on slips of paper and pasted to the rough notes.

He may assist the accused to prepare his defense, or read it for him, after which he has the right of reply and to the last word. He takes the vote of the court as to finding and sentence; but the president obtains the opinion of the court on questions of evidence, adjournment, etc. Decisions of the court are announced to the witness or accused by the judge advocate. Not being a member he has no vote, is not responsible to the civil authority for his opinions, and cannot be challenged, although he has the right to challenge any member suspected of undue partiality for, or interest in, the accused. While he may sum up the evidence, and call attention to facts, it is not proper for him to give an opinion as to the guilt of the accused, nor earlier in the trial to advise the accused to plead guilty. He is a competent witness for either side, and, if called, should be sworn by the president, interrogated by the court or the accused as the case may be, and have his testimony recorded by the clerk; or if necessary he may do it himself. Should he die, or be disabled, pending the proceedings, another may be detailed, unless it happens between the conclusion of the trial and the authentication of the record, in which rare event the sentence is inoperative (Holt's Digest). The court cannot appoint a judge-advocate, no member can act as such, and a vacancy must be referred to the convening officer. His absence during the trial does not invalidate the proceedings, but should be avoided if possible. When it cannot be helped it is better for the court to adjourn from day to day until his return.

Finally, he gives certificates of attendance to the witnesses and such members as are entitled to allowances; forwards the record through the president, and if he has been patient, respectful, impartial, and sedulously careful of the rights of all concerned, he has performed an arduous duty well.—*Henry C. Cochrane, Captain U.S.M.C.*

Judge-advocate-general. This title is comparatively new in the United States, where it is given to two officials who are appointed by the President, by and with the advice and consent of the Senate. In the army it is held by the senior law officer, who is also chief of the Bureau of Military Justice, an outgrowth of the Rebellion, and enjoys the rank, pay, and allowances of a brigadier-general. The first judge-advocate-general in this country was the Hon. Joseph Holt, of Kentucky, who was appointed colonel and judge-advocate-general, September 3, 1862; promoted to brigadier-general, June 22, 1864, and retired at his own request (being over sixty-two years of age), December 1, 1875. He was succeeded by Brig.-Gen. Wm. McKee Dunn, the present incumbent, who has under his direction a corps of eight judge-advocates with the rank and pay of major of cavalry. Prior to the institution of the office of judge-advocate-general (1862), there was but one judge-advocate for the entire army, and he was required to be selected from the captains of the line of the army, and given the brevet rank and pay of a major of cavalry. The office seems to have been first established in the regular army March 3, 1797, by an act which authorized a judge-advocate to be taken from the commissioned officers of the line, and granted extra pay and rations.

In the navy, we find that Congress, by act of March 2, 1865, authorized the President to appoint "for service during the Rebellion, and one year thereafter, an officer in the Navy Department to be called the Solicitor and Naval Judge-Advocate-General." To this office was appointed a civilian, the Hon. John A. Bolles, of Massachusetts, who held it until his death, in 1878. After the term for which it was created had expired, it was with great difficulty that the Congress was induced to continue it. Indeed, one year passed without any appropriation being made for the salary of the incumbent. When the office of the Attorney-General of the United States was reorganized, and the Department of Justice established in 1870, there was included in its *personnel* "a naval solicitor, at a salary of $3500 a year," and that is all that was said of this important office. Mr. Bolles's name was dropped from the navy register and placed upon the rolls of the new department. At his death he was succeeded by Capt. William B. Remey, U. S. Marine Corps, as "acting judge-advocate-general" until June 8, 1880, when, mainly through his exertions, a bill was passed by Con-

gress which placed the office upon a better footing than it had ever known. This measure authorized the President to appoint from the officers of the navy or marine corps, for the term of four years, a judge-advocate-general of the navy, with the rank, pay, and allowances of a captain in the navy or a colonel of the marine corps, as may be, and Capt. Remey was the first appointee, with the rank of colonel.

His place of duty, or office, was fixed in the Navy Department, "where he shall, under the direction of the Secretary of the Navy, receive, revise, and have recorded the proceedings of all courts-martial, courts of inquiry, and boards for the examination of officers for retirement and promotion in the naval service, and perform such other duties as have heretofore been performed by the solicitor and naval judge-advocate-general," a title, by the way, then extinct for ten years. As these duties had never been very particularly defined, or generally understood, the Secretary of the Navy, Hon. R. W. Thompson, issued a circular June 28, 1880, also a general order of same date (No. 250), prescribing them minutely, and thus the law was promptly made operative and the office strongly established.

The circular announced that all matter submitted to the Secretary involving questions of law or regulation would be referred by him, or the chief clerk acting under him, to the judge-advocate-general for examination and report, and directed that the chiefs of the several bureaus and the officers connected with the Navy Department, and the clerks of the Secretary's office, should furnish the judge-advocate-general with all such facts and information of record, bearing upon cases under consideration by him, as he might require, and that the records of all courts, boards, etc., should be filed in his office. The general order informed the service of the creation of the office, and ordered that the proceedings of all courts, boards, etc., convened by order of the Secretary of the Navy should be forwarded *direct* to the judge-advocate-general, who shall report upon and have them recorded; and all proceedings of courts, boards, etc., convened by other naval authority shall, after action thereon by the convening and reviewing officers, be forwarded and treated in the same manner. All communications pertaining to questions of law or regulation arising before courts and boards which may require the action of the Department are also to be sent to this officer direct.

Turning to England, we find that there was in the olden time a "judge-martial," or "advocate-general," who was the supreme judge in martial law as to the jurisdiction and powers of military courts. It devolved upon him, as well as upon his deputies, "to be well acquainted with the laws of the land, that they may admonish the court, or president, when the proceedings tend to infringe the civil law." He was "the register of courts-martial," and took down the evidence "in the very words of the witness," but was neither a judge nor a juror as to the charge.

This official is now "The Rt. Hon. the Judge-Advocate-General, London," the adviser of the crown in matters of military law, a barrister, member of Parliament, and of the Privy Council. The proceedings of all district, garrison, and general courts-martial are submitted to him for approval, the latter being laid before the queen by him for confirmation. A deputy judge-advocate is appointed to attend at all general courts-martial and advise the courts as to points of law. In general courts he prepares the charges against the accused, but in other courts this is done by the commanding officer. See JUDGE-ADVOCATE.—*Henry C. Cochrane, Captain U.S.M.C.*

Julian Period. A period of 7980 years, dating from B.C. 4713; being the product of the numbers 15, 19, and 28 multiplied into each other, they being respectively the lengths, in Julian years, of the Indiction, Metonic Cycle, and Solar Cycle. The Julian year was a period of 365¼ days, which was adopted as the length of the year after the reformation of the calendar by Julius Cæsar. See CALENDAR.

Jumper. A loose frock descending to the ship and worn outside the trousers. A rope attached to the outer end of the whiskers to keep them from canting upwards.

Jump-jointed. Flush-jointed; applied to the plates of an iron vessel.

Jungada. See JANGADA.

Junk. The Chinese junk is the largest vessel built by that nation, and at one period exceeded in tonnage any war-vessel then possessed by England. The extreme beam is one-third from the stern; it shows no stem, it being chamfered off. The bow on deck is square, over which the anchors slide fore and aft. Having no keel, and being very full at the stern, a huge rudder is suspended, which at sea is lowered below the depth of the bottom. The masts are immense, in one piece. The hull is divided into water-tight compartments, like tanks. *Junk* is also remnants or pieces of old cable or condemned rope, cut into small portions for the purpose of making points, mats, swabs, gaskets, sennit, oakum, and the like. Also, a dense cellular tissue in the head of the sperm-whale, infiltrated with spermaceti. Also, salt beef, as tough to the teeth as bits of rope, whence the epithet.

JUNK-WAD. See WAD.

Junket. A long basket for catching fish.

Junketing. Good cheer and hearty jollification.

Jupiter. The largest planet of the solar system. The mean distance of Jupiter from the sun is 496 millions of miles, and, since the eccentricity of its orbit is about 1-20th, this distance is augmented in perihelion and diminished in aphelion by about 24 millions of miles. Jupiter makes a revolution about the sun in 11.8 years; it revolves on its axis in $9^h\ 55^m$; its equatorial diameter is 92 millions of miles; apparent diameter 30″ to 48″, and its volume is 1400 times that of the earth. Viewed through a powerful telescope Jupiter exhibits a light yellowish color, having a series of brownish-gray streaks, called *belts*, running nearly parallel to the equator. Jupiter is attended by 4 satellites at distances varying from 280 to 1200 thousand miles, and varying in size from 12 hundred to 35 hundred miles. Jupiter is a body of the greatest importance to the navigator; for besides serving in a pre-eminent manner the ordinary purposes of bright stars, such as determining the latitude, and also by its lunar distances furnishing the means of finding the longitude, the eclipses of Jupiter's satellites give an independent method of obtaining the longitude. Symbol ♃, from the initial of Zeus, the Greek name of Jupiter.

Jurebasso (*Eng.*). A rating in former times given to a handy man, who was partly interpreter and partly purchaser of stock.

Jurisdiction. The legal power or authority of the government or of a branch thereof. The limit within which power may be exercised; extent of power or authority. See INTERNATIONAL LAW.

Jury-anchor. See ANCHOR.

Jury-mast. A temporary mast erected in a ship in the place of one which has been carried away in a gale, battle, etc. Jury-masts are sometimes erected in a new ship to navigate her down a river, or to a neighboring port, where her proper masts are prepared for her.

Jury-rudder. A contrivance, of which there are several kinds, for supplying a vessel with the means of steering when an accident has befallen the rudder.

Jus Piscandi. The right of fishing.

Jute. The fibre of an East Indian plant (*Corchorus capsularis*), and, also, of the plant *Corchorus olitorius.* It is used for making rope, matting, gunny, and other coarse fabrics.

Juwaur. The spring-flood of the Ganges and adjacent rivers.

K.

Kabbilow. Codfish salted but not thoroughly dried.

Kabozir. A chief or governor on the African coast.

Kaburns. An old word for nippers.

Kafila. An old word for a convoy of merchant-vessels.

Kalmar. A fortified town and seaport of Sweden, capital of a læn of the same name. It is situated on the southeast coast, on the Kalmar Sound, opposite the island Oland, about 200 miles S.S.W. of Stockholm. It is the terminus of a railway, and has a good harbor, a fine church, a prefecture, a strong castle, now a house of correction, an academy, a gymnasium, a dockyard, and manufactories of woolen stuffs, tobacco, and potash. In its castle the treaty called the "Union of Kalmar," which settled the succession of the three northern kingdoms upon Queen Margaret of Denmark and her heirs forever, was agreed to by the deputies of the three kingdoms on the 12th of July, 1397. The union, however, lasted only till the death of Margaret. Pop. about 10,000.

Kamsin. A southwesterly wind which blows over Egypt during March and April.

Kanagawa. A town of Japan, situated on the west side of the bay of Tokio, and on the railway from Tokio to Yokohama, 15 miles S. of Tokio and 3 miles N. of Yokohama, from which it is separated by a lagoon. It has a fort and barracks, and is one of the treaty ports. It formerly had a larger foreign trade than any other port of Japan, but with the rise in importance of Yokohama, Kanagawa has declined. Pop. 4000.

Kanaris, Konstantin. A native of the isle of Ipsara, distinguished for his exploits in the Greek war of independence. In 1822 he blew up the Turkish admiral's ship in the Strait of Chios, and the same year performed a similar exploit in the harbor of Tenedos. On the 17th of August, 1824, he avenged the wrongs which his native isle had suffered from the Turks by burning a large Turkish frigate and some transport-ships which were carrying troops to Samos, thereby also saving Samos from the ravages which Chios and Ipsara had endured. In 1825 he formed the bold design of burning the Egyptian fleet then lying in the harbor of Alexandria ready to carry troops to the Peloponnesus, and only the springing up of an unfavorable wind prevented the success of his undertaking. He held important commands under the Greek president, Capo d'Istrias, and in 1848–49 was war minister and president of the cabinet. In 1862, as admiral of the fleet, he took part in the revolution which overthrew the government of King Otho.

Kane, Elisha Kent, was born in Philadelphia, Pa., February 3, 1820, being the eldest of the seven children of the Hon. John K. Kane, United States judge for the Eastern District of Pennsylvania.

Dr. Kane numbered among his ancestors the Kanes and Van Rensselaers, of New York, and the Grays and Leipers, of Pennsylvania,—all well-known and highly-honored names.

As a boy he was small for his age, but very active and daring; noted for venturous escapades and for his skill as a rider,—and though early devoted to experimental chemistry and physics, showing no great fondness for books.

At sixteen, however, he began to work,—his studies being directed with a view to his ultimately becoming a civil engineer. When about to enter Yale College he discovered symptoms of disease of the heart. from which he was never afterwards entirely free. This caused a change in the plan of his education, it being thought better, both on account of the climate and the ability to select his course of study, to enter him at the University of Virginia. Here he pursued the natural sciences — chemistry, mineralogy, physical geography, and geology—under the celebrated Professor Rogers, with the usual course of mathematics and classics. He was a good student in all of them, and they were destined to prove of the utmost value to him in his subsequent labors. He took no degree, his studies being interrupted by an attack of rheumatism involving the heart. He was long almost hopelessly ill, with a slow and doubtful recovery, which left him subject to sudden death at any moment. During his whole after-life he suffered from rheumatism and cardiac disease, except

when in the high northern latitudes, when scurvy, which in his case seemed incompatible with them, took their place. The breaking down of his health caused him to give up the profession of engineering and to take industriously to the study of medicine, following his father's advice, "If he was to die, to die in harness."

In his 21st year, while still an under-graduate, and still in a critical condition of health, he was made one of the resident physicians of the Philadelphia Hospital. In addition to bestowing sedulous attention upon his regular duties, he here made many original experiments upon a subject relating to pregnancy, which was then much occupying the medical mind,—which experiments were of so thorough and scientific a nature as to satisfy the profession both in this country and in Europe. His graduating thesis, on the same subject, was published at the request of the medical faculty of the University of Pennsylvania.

Without the son's knowledge, Kane's father had applied for permission for him to enter the navy as an assistant surgeon, and he was at first much opposed to doing so, but finally yielded and worked hard to prepare for the examination. After passing he told the board of his disability, but he just then seemed so well, and had exhibited such proficiency, that they declined to revoke their favorable decision.

While waiting a vacancy, Dr. Kane was appointed physician to Mr. Cushing's embassy to China, and sailed in May, 1843, in the frigate "Brandywine," for Bombay, there to meet the minister, who was to go overland. The Secretary of the Navy had given permission for him to accept this post without prejudice to his position in the navy.

On the voyage out the "Brandywine" was detained for some time at Rio Janeiro, and Kane seized the opportunity of making a geological reconnoissance of the Eastern Brazilian mountains, occupying his time while at sea in studying navigation and languages. Mr. Cushing was delayed for a long time by the burning of the steam-frigate "Missouri" at Gibraltar, and the "Brandywine" waited at Bombay, Kane making several extended trips, and even going as far as Ceylon and there joining in an elephant hunt.

When the "Brandywine," with the embassy, at length reached Macao, Kane found his commission there waiting for him, but he continued attached to the commissioner's staff until July, 1844, when the treaty was signed.

With Mr. Cushing's sanction he had, in the mean time, gone to Luzon, traversed that little-known island to its Pacific shores, explored the asphaltic lakes, and descended, with extreme labor and peril, to the bottom of the crater of the great volcano of Jael, and, in consequence, nearly lost his life at the hands of the savages, who resented his exploration of the mysteries which they worshiped. Only one person had before attempted this perilous feat, and he was unsuccessful.

Upon Mr. Cushing's return to the United States, Kane resigned his place in the embassy, and intended to resign from the navy, with a view to practicing in Whampoa until he had amassed a sufficient sum to enable him to carry out a darling scheme,—the exploration of the remoter parts of Eastern Asia. After a short time, however, he broke down with fever and was obliged to change the climate.

By way of Singapore and Ceylon he reached India, when he traveled up the country and made an ascent of the Himalayas. From India he passed through Persia and Syria to Egypt, ascending the Nile, and having a number of adventures, among others, a fight with a party of Bedouins, losing all his luggage, and receiving a wound in the leg. This necessitated a return to Alexandria for treatment, during which he suffered a nearly fatal attack of plague; his convalescence from which was rendered doubly tedious by the annoyance caused by the loss of some prized collections which he had sent down the river in a native boat.

As soon as he was able to travel he set out for Greece, which country he explored, mostly on foot. Thence he visited Italy, Germany, and Switzerland, examining glaciers, and forming theories as to ice action, which he was destined to put to practical use. From Switzerland he went to Paris, and while there endeavored, by correspondence, to obtain permission from the Spanish government to practice his profession in Luzon, with a view to further exploration there, but in this he failed.

He now returned to Philadelphia, and, at the earnest solicitation of his family, engaged for one winter in professional occupations, with fair prospects. At this time he would have resigned from the navy had there not been a prospect of hostilities with Mexico; and when war with that country broke out, he at once applied for duty. Instead of being sent to Mexico, however, he was, in May, 1846, ordered to the coast of Africa, in the frigate "United States," Commodore Read.

During his visit to Brazil Kane had met, and put under obligations, the great slave-trader, De Souza, who had given him letters to his agents in Africa. These now proved useful, and he visited most of the slave-factories from Cape Mount to the Bonny River, and even accompanied (with Commodore Read's permission) a caravan from one of De Souza's factories, which carried a present to the king of Dahomey.

Some months after this he was prostrated by a severe attack of the coast fever, and in March, 1847, it was found necessary to invalid him home, from Liberia. Kane always maintained that this illness was the most shattering of the many which he experienced.

By the time he had partially recovered the American army was in possession of the city of Mexico, but Col. Childs was besieged in Puebla, and communication with the coast was much interrupted. An important dispatch had been three times sent to Gen. Scott, and no answer had been received. Just then Kane appeared in Washington, highly recommended, and anxious for any service in which he could distinguish himself; and the President resolved to confide the verbal message to him, as well as important written orders.

He set out in November, sailing from New Orleans. The steam-transport which carried him was nearly lost in a severe "norther," the passengers being obliged to bail the vessel with camp-kettles; but they at last succeeded in reaching Vera Cruz. From this point he went

as far as Perote with a detachment of American troops; and as they went no farther he then joined a renegade spy company, under the command of the notorious Col. Dominguez.

On the 6th of January, 1848, the escort encountered, near Nopaluca, a band of Mexican guerrillas, who were escorting some Mexican officers to Orizaba.

A sharp engagement at once ensued, the spy company fighting "with ropes round their necks," and so desperately that Gens. Gaona and Torrejon, Col. Gaona, 2 captains and 38 men were taken prisoners.

In the charge Kane was wounded and had his horse killed. Gen. Gaona, who was also wounded, surrendered to Kane, who had great difficulty in preventing the murder of his prisoner by the renegades; and then, in spite of his own condition, had to act as surgeon to the general and other wounded. After this adventure Kane remained for a long time ill at Puebla, from the effects of his injury and from typhus fever, and his life was saved, he always declared, by the attention and nursing he received from the grateful family of Gen. Gaona, who were residents of the town.

When Kane finally reached home he was presented with a handsome sword by some of the foremost citizens of Philadelphia.

In the succeeding year he was attached to the U. S. ship "Supply," in which he visited Lisbon and the Mediterranean, as well as Rio Janeiro. During this cruise he had another dangerous illness, nearly losing his life from lock-jaw. Indeed, his whole life seems to have been a struggle against disease of some kind, which renders his wonderful energy and industry the more remarkable.

Having passed his examination for promotion, and while serving in Mobile Bay upon the coast survey, he was, in 1850, upon his urgent application, appointed to the United States Grinnell Expedition; and, in two days after reporting at New York, found himself on his way to the extreme north. The vessels, supplied by the liberality of Mr. Henry Grinnell, were two hermaphrodite brigs,—the "Advance," of 144 tons, and the "Rescue," of 91 tons. Kane was medical officer of the "Advance."

Lieut. De Haven, who commanded the expedition, had had some experience in the Antarctic, under Wilkes, and was an excellent officer, with qualities peculiarly fitting him for his arduous duties.

The year 1850 was prolific in Polar expeditions, no less than 10 British vessels being in search of traces of Franklin, beside a land-party under Dr. Rae.

Twenty thousand pounds sterling were offered for the discovery and effectual relief of Franklin's party, but the officers and men of the American expedition signed a bond not to claim the reward in case of success.

Kane started on the voyage in very indifferent health, and was so prostrated by sea-sickness that De Haven urged him to go home from Greenland, fearing his ability to endure the necessary hardships of the cruise. This he could not be persuaded to do; and his health improved when the real work of the expedition began.

In the passage up Wellington Channel, De Haven saw and named Grinnell Land, which was named Albert Land by Penny, eight months afterwards. Very considerable discussion arose afterwards about this point, but the prior discovery of De Haven was at last allowed by geographers, greatly through the exertions of Kane, who became the historian of this eventful voyage, which occupied 16 months, during nine of which the vessels were ice-locked and drifting.

In 1852, before the book was fairly through the press, Kane was off to the Polar regions again, —this time in command. Mr. Grinnell again gave the "Advance," in which Kane placed the generous donor's name much farther north than the previous expedition had done.

The funds for this expedition were derived partly from the government, which contributed ten naval seamen and their rations, and instruments, books, and medical stores. The American Philosophical Society, the Smithsonian Institution, the Naval Observatory, and the Naval Medical Bureau also added to the rather meagre outfit, while Kane himself contributed his pay and the proceeds of a number of lectures delivered by him upon Polar Exploration. He also received contributions from private persons, chief among whom was Mr. Peabody, who gave $10,000.

There was no Congressional aid. Mr. Kennedy had promised certain assistance within his own powers, and when he left the Navy Department his successor, Mr. Dobbin, though lukewarm, would not undo his predecessor's work.

Just as the time for sailing came Kane had a violent attack of inflammatory rheumatism, but he persevered, was carried on board, and in good time reached Upernavik.

On July 25, 1853, having completed his purchases of furs and dogs, and engaged his Esquimaux, he sent off his last letters and plunged into the unknown regions of the North. He had full faith in the survival of some of Sir John Franklin's people; but while he took every means of inquiry in regard to them, he was also careful to keep up the various observations which he was so competent to make.

He spent two winters in the ice, having a more than usually severe experience of the Arctic winter. In June, 1854, the brig then ice-bound in Rensselaer harbor (78° 37′ 10″ N., and 70° 40′ W.), Kane and Sontag, the astronomer, being sick with scurvy, and Dr. Hayes, the surgeon, snow-blind from a survey of Grinnell's Land, Kane sent one of his petty officers (Morton) to 81° north to look for the open Polar sea. Morton brought back the report of having seen such a body of open water,—which has ever since provoked so much discussion and comment.

Far exceeding all other trials during the expedition was his search, in March, 1855, for a sledge-party which became exhausted upon the ice during an unusually severe storm, when the thermometer reached 78° below freezing. Fortunately, the party was found and rescued.

By the second winter of the absence of the expedition great anxiety concerning it began to be felt, especially as the first winter had been a severe one, and it was known that the outfit was, in some respects, deficient. Congress was memorialized, and public opinion favored an expedition of relief. By authority of Congress such an expedition sailed in the early summer, well provided, and well officered and manned. The vessels were the propeller "Arctic" and the bark

"Release," under command of Lieut. Hartstene, U. S. Navy, who made a request to the Secretary of the Navy that, in case they did not return within the expected time, no expedition should be sent in search of them, "to avoid further risk of human life."

After a tour of Baffin's Bay, encountering heavy ice, Hartstene picked up the adventurers of Kane's party, who were upon their return to civilization. They had abandoned their vessel, hopelessly ice-bound, and accomplished their own delivery by means of a perilous journey over the ice, bringing their own boats with them on sledges, and making a trip of 1300 miles through Smith's Sound and Melville Bay. They were found at Lievely, on the eve of taking passage in a Danish vessel for Europe. Hartstene took them on board, and they reached New York October 11, 1855, after an absence of thirty months.

Kane at once set about his interesting and complete work, entitled "Arctic Explorations: The Second Grinnell Expedition in Search of Sir John Franklin, 1853–54–55."

Kane's health, always wretched, now steadily failed,—as he himself thought from the combined effects of rheumatism and the scurvy taint. But he worked early and late to get his charming book finished, of which he said, "poor as it is, it has been my coffin." On the contrary, it is his best monument.

The admirable illustrations of this work are all from sketches by himself, afterwards worked up by the distinguished marine painter, Hamilton, who thought very highly of them; and Blackwood and other reviews of the time praised these sketches made in a killing temperature by a sick man, with mittened hands, upon a companion's shoulders. His book was a tremendous success, the copyright upon the first year's sales amounting to $65,000.

Kane fully intended, if he ever rallied sufficiently, to publish for "reputation's sake," either through the government or the Smithsonian Institution, a scientific work upon ice.

No public recognition of his services was ever given by Congress; not even the extra pay and emoluments usually voted to such explorers. Secretary Dobbin referred to the expedition (which he had no hand in promoting) in his annual report, remarking that "he had advanced far beyond his intrepid predecessors," and especially remarking his "miraculous and successful journey over the ice in open sledges for eighty-four days."

A gold medal was, indeed, ordered by Congress, but not until after his death. But from other sources the recognition of his services came in thick and fast. He received the gold medal of the Royal Geographical Society with favorable mention—a high honor: the queen's medal for Arctic explorers—and a testimonial from the British residents of New York. The Legislatures of New Jersey, Pennsylvania, and Maryland also gave him a vote of thanks for his exertions.

The principal results of Kane's expedition may be briefly stated as—

1st. The discovery of 960 miles of coast-line, principally by 2000 miles of travel on foot and by dog-teams.

2d. The Greenland coast traced to its northern face.

3d. The survey of the Humboldt glacier.

4th. The discovery and delineation of the coast of Washington Land.

5th. The same accomplished for a large tract forming the northern extremity of our continent.

6th. The discovery of a large channel to the northwest free from ice, and supposed to lead into the open Polar Sea.

By the time the book was published the author's condition of health became most alarming, but his friends still clung to hope of recovery on account of his well-proved tenacity of life. The hand of death was, however, upon him, but, with faint hopes of improvement from change of climate, he sailed for England. Finding himself worse there, he sailed for St. Thomas, and thence managed to reach Havana, where his mother and brother arrived about the same time, to find him paralyzed, but consumed with a dying man's anxiety to die at home. His last wish was not gratified, for he died at Havana, February 16, 1857.

Just thirty-seven years old at the time of his death, Kane had probably accomplished more arduous travel than any other explorer of his day. Rather spare, and below the average height, with large and well-formed head and chest, he had dark-brown hair, gray eyes, and fair complexion. With temperate habits and a delicate eater, he possessed great muscular power, and was a skillful horseman, a capital pedestrian, and a good shot. His self-reliance was perfect, and his power to govern his subordinates was very great. His expedition towards the Pole was a private venture, the men volunteers, and yet in the most perilous and doubtful periods they never questioned his movements or orders. He showed especial capacity in his management of the natives at Etah, an Esquimaux village, converting them from attempting plunder of the vessel and threatening the lives of the white men to a friendly condition, in which they rendered the greatest assistance to the distressed party.

His professional and scientific attainments, undoubtedly great, were held by him as adjuvants to the great object of his life,—exploration, by which he built up the world with fame not only for himself, but for his country.

His remains were brought from Havana to New Orleans, and thence by the river to Pittsburgh, and finally to his native city, being received at all points with the highest honors, civic, military, and Masonic.

He was finally, after lying in state in Independence Hall, interred at Laurel Hill Cemetery, on the banks of the Schuylkill.—*E. Shippen.*

Kanjia. A passage-boat of the Nile.

Karavalla. See CARAVEL.

Karbatz. A common boat of Lapland.

Kava. A beverage in the South Sea Islands, made by steeping the *Piper inebrians* in water.

Kayak. A fishing-boat common in northern regions, probably a corruption of *caïque.*

Kaynard (Fr. *cagnard*, a skulker). An obsolete term for a rascal; a cowardly, good-for-nothing fellow.

Kayu-putih, or Cajeputi Oil. (From the Malay words *putih*, white, and *kâyû*, tree.) An essential oil obtained from the leaves of two species of *Melaleuca.* It is fragrant, and has a strong, pungent taste.

Kazie. A fishing-boat used by the inhabitants of the Shetland Islands.

Keavie. A kind of crab.

KEAVIE-CLEEK. An instrument used for catching the keavie in the north of England.

Keckling. Small rope or strands wound about cables or hawsers to protect them from chafe.

Kedge. A small anchor used for moving a vessel from one part of a harbor to another, or for a temporary anchorage. It is usually carried out in a boat and dropped as required. *To kedge*, to move a vessel by means of a kedge.

KEDGER. An old English name for a fisherman.

KEDGE-ROPE. The rope or hawser used with a kedge.

Keel. The principal timber of a ship, and that which is first placed upon the keel-blocks. It extends from the stem to the stern-post, both of which may be considered as continuations of it. It is composed of several sections scarfed together, each of which should be of sufficient length to allow the fastening of four frames. White oak is used for this purpose in naval vessels. A flat-bottomed vessel or lighter used in the river Tyne, in England, for carrying coal. A *bilge keel* is a construction of keel peculiar to ironclad vessels, extending only a portion of the length of the vessel under the bilges. A *keel-boat* is a kind of freight-boat used on Western rivers. A *false keel* is made of oak planks bolted to the under side of the keel, to protect it from injury in case of grounding. A vessel is *on an even keel* when the draft of water at the bow and stern is the same. The *rabbet of the keel* is the groove which is cut in each side of the keel to receive the edges of the garboard strake.

KEELAGE. The duty or tax which is imposed upon a vessel while in port.

KEEL-BLOCKS. One of the short pieces of timber upon which the keel of a vessel rests when being built, or when in a dry-dock undergoing repairs.

KEEL-DEETER. The woman who sweeps out the keels or coal-lighters used in Newcastle, England.

KEEL-HAULING. A punishment inflicted formerly in the English and Dutch navies for a certain class of offenses. It consisted in hauling the offender under the vessel's bottom from one fore-yard-arm to the other by means of whips, weights being attached to his body to cause him to sink rapidly in the water.

KEELMAN. A bargeman of Newcastle, England. One who manages a keel.

KEEL-PIECE. One of the timbers or sections of which the keel is composed.

KEEL-RAKE. To keel-haul.

KEEL-ROPE. The name of a rope formerly used to keep the limber-holes clear.

KEELSON. A timber of white- or live-oak placed above the keel and bolted to it, which serves to bind the floor-timbers to the keel. *Bilge* or *boiler keelson*, one of the timbers placed in the bilge of a steamer parallel to the main keelson, upon which the boilers rest. *Engine keelson*, one of the timbers upon which the bed-plates rest, and which form the foundation for the engine. *Sister keelson*, a timber placed at the side of the main keelson, and bolted to it. It is also bolted through each timber to the garboard strake.

KEELSON, RIDER-. A timber bolted on top of the main keelson, sometimes called *capping;* the term *rider* is used generally when an increase of strength is required,—such as an additional timber or timbers which are not included in the framing of the ship.

KEEL-STAPLE. A large staple used in fastening the false keel to the main keel.

Keeling. A kind of small cod.

Keep a Good Hold of the Land. To keep the land in plain sight.

Keep a Good Offing. To keep at a safe distance from the land.

Keep a Watch. To be in charge of the deck, or to be on duty with the watch.

Keeper. A jam-nut, set-screw, or other device used to prevent a nut working off or key drawing.

Keep Full for Stays. An order to the helmsman, by which the vessel may have greater speed previous to tacking, or going into stays.

Keep Her Own. Said of a vessel when her speed against a current is equal to the force of the current, or when she holds her position.

Keep Her Way. To retain speed through the water after the vessel is deprived of her motive-power, as by stopping the engines or reducing sail.

Keep Off. To keep a vessel away from the wind. To keep at a distance.

Keep the Land Aboard. To keep within sight of the land and at a moderate distance from it.

Keep the Sea. To retain mastery over the sea. The importance of controlling the English Channel was evident during the reign of Henry V., when his successes against the French depended in a great degree upon the possession of the Channel, or "Narrowe Sea." In lieu of naval vessels, merchants were required to "keepe the sea" with their ships, and from May, 1406, to September, 1407, the British coast was guarded in this manner.

Keep Your Luff. An order to the helmsman to keep close to the wind, when close-hauled.

Keg. A small cask. (*Eng.*) A cant word, meaning to irritate.

Kelk (*Eng.*). The roe of fish. A large stone. To stone.

Kelp. A common term for sea-weed, or vraic, which consists of different species of *Fucus*. In a strict sense the term kelp is confined to the produce of sea-weeds when burned. These being first dried in the sun, are burned in shallow excavations at a low heat. About 20 or 24 tons of sea-weed yield one ton of kelp, which, as met with in commerce, consists of hard, dark-gray, or bluish masses, which have an acrid, caustic taste, and are composed of chloride of sodium, of carbonate of soda (formed by the decomposition of the organic salts of soda), sulphates of soda and potash, chloride of potassium, iodide of potassium or sodium, insoluble salts, and coloring matter. It used to be the great source of soda (the crude carbonate), but as this salt can now be obtained of better quality and less cost from the decomposition of sea-salt, it is prepared in far less quantity than formerly. Kelp is largely used as a source of iodine, and it is said that a ton of good kelp will yield about 8 pounds of iodine, large quantities of chloride of potassium, and additionally, by destructive distillation, from

4 to 10 gallons of volatile oil, from 4 to 15 gallons of paraffine oil, 3 or 4 gallons of naphtha, and from 1½ to 4 hundred-weight of sulphate of ammonia.

Kelper (*Eng.*). An imaginary being or spirit believed by the ignorant and superstitious to haunt certain localities and warn people of danger.

Kelt. The name in Scotland for a salmon after spawning.

Kelter. Order or condition.

Kemstock. An old name for a capstan.

Ken. To recognize; to know.

Kennet. See Kevel.

Kenning by Kenning. An old expression among whalers, denoting that a man received pay according to the value of his services.

Kenning Glass. An obsolete term for a spy-glass.

Kenspeckle. To mark in such a way as to be easily recognized.

Kentledge. Pig-iron used for ballast.

Kentledge Goods. Heavy portions of the lading of a vessel that can be used as ballast.

Kent-purchase (a corruption of *cant-purchase*). A tackle used by whalers to cant or turn the whale during the operation of flensing.

Kepler's Laws. Three natural laws discovered by Kepler,—1st. Each of the primary planets revolves in an ellipse, having one of its foci in the sun. 2d. That equal areas are described in equal times. 3d. That the squares of the periodic times of the planets are proportional to the cubes of their mean distances from the sun.

Kerfe. The notch or slit made in cutting or sawing timber.

Kerguelen's Land, or Island of Desolation. A rocky island about 100 miles long and 50 broad, lying in the Antarctic Ocean, the latitude and longitude of its southern extremity, Cape George, being 49° 54′ S., and 70° 12′ E. It was discovered in 1772 by the French navigator Ives Joseph de Kerguelen Tremarec, and is said to contain coal fit for steamships.

Kerguelen's Land Cabbage (*Pringlea antiscorbutica*). The only known species of a very curious genus of plants of the natural order *Cruciferæ*, and found only in Kerguelen's Land. It is very useful to the crews of whalers and other vessels which have occasion to touch there. It has a long, stout, perennial root-stock, and a *bolled* head of leaves very similar to those of the common garden cabbage. The root-stocks have the flavor of horse-radish. The dense white heart of the cluster of leaves tastes like mustard and cress, but is coarser. The whole foliage abounds in a very pungent, pale-yellow, essential oil, which is confined in vessels that run parallel to the veins of the leaf. This plant was first discovered and brought into notice by Capt. Cook. It is used by voyagers, boiled either alone, or with beef, pork, etc., and is highly valued by them for its antiscorbutic properties.

Kermes. Dried bodies of the females of the *Coccus ilicis*, an insect found near the shores of the Mediterranean. They are valuable as a dye.

Kert. An obsolete term for chart.

Kertch. A fortified town of Russia, in the Crimea, on the peninsula of Kertch. Lat. 45° 20′ N.; lon. 36° 28′ E. In 1827 it was declared a free port. It has a navy-yard and foundry, and a large export trade in stone, fish, hides, grain, etc. Pop. 23,000.

Kertk, Admiral Sir David, commander of a successful expedition against Canada; had been a master-mariner at Dieppe, France, but entered the English naval service in the reign of Charles I. Placed in charge of a formidable force, and accompanied by his two brothers, he arrived at Tadoussac, in midsummer, 1628, and after destroying the stores, etc., sent a summons to Champlain to surrender, which was refused. Kertk, thinking Quebec strongly fortified, after capturing a French convoy on its way to Quebec, went home. In July, 1629, he returned again, demanded a surrender; and Champlain, being weaker than ever, capitulated. Kertk, leaving his brother Lewis in command of the city, proceeded to England, taking Champlain and others with him as prisoners of war. He afterward captured Cape Breton, which was recaptured by Capt. Daniel. These events took place two months after peace had been concluded between France and England, and were not recognized by either nation. As late as 1645 he was on the coast of Newfoundland.

Ketch. A small vessel formerly used as a yacht, and still later as an armed vessel. It was rigged with two masts, which were placed in nearly the positions of the main- and mizzen-masts of a ship, thus leaving a clear deck forward of the mainmast. On this account they were greatly used as bomb-vessels.

Kettle-bottom. A name applied to a vessel with a flat floor.

Kettle-net. A net formerly used in catching mackerel.

Kettle of Fish. A person makes a *pretty kettle of fish* when he has involved himself in difficulties by bungling.

Kevel. A large cleat for belaying ropes, usually called a *cavil*.

Kevel-head. The upper end of a timber used for belaying ropes.

Keveling. A name on the English coast for the skate.

Key. A wooden pin driven into a scarf to prevent the pieces from slipping. An iron pin driven through a hole in the end of a bolt to prevent it from slipping out of its socket. A piece of metal made tapering, and used to secure wheels, pulleys, couplings, etc., on shafts, and to tighten journal-boxes. A device used for closing and breaking an electric circuit. A wharf or pier (see Quay). The low islands of the West Indies are called keys, or *cays*, the term being derived from the Spanish word *cayo*.

Keyage. The charges for the use of a key or quay.

Key-bolt. One secured by a cotter or wedge.

Keyle. See Keel.

Key-model. A model of a vessel formed by different layers of board fastened together by keys and screws.

Key West. A port of entry and capital of Monroe County, Fla., on Thompson's Island, in lat. 24° 32′ N., lon. 81° 48′ W. It has a safe harbor, of which the entrance is protected by Fort Taylor. Vessels drawing 20 feet or more of water can be easily admitted. It has extensive manufactories of cigars, important sponge-fisheries, and some salt-works. Pop. 5000.

Khalishees. Native East Indian sailors.

Khania. A fortified seaport and the principal commercial town of Crete. Its fortifications, built by the Venetians, are inferior to those of Candia, but its port is the finest in Crete, capable of holding many vessels. The town has an arsenal, docks, soap-factories, etc. Pop. 8500.

Khizr. An East Indian sea-god.

Kibblings. Portions of a fish which are used for bait in the vicinity of Newfoundland.

Kick. To recoil. A common term used in relation to fire-arms.

Kick the Bucket. An irreverent expression for dying.

Kid. A small wooden tub. A slang phrase for a young child. A heap of bushes planted on a beach to gather sand, gravel, etc., to prevent the washing away of the land.

Kidders. A fence formed of stakes in a river for catching fish. Also an obstruction to vessels.

Kidleywink (*Eng.*). A low beer-shop.

Kidnap. To carry off a human being by force or artifice.

Kidney. Kind or habits, as "men of the same kidney."

Kiel. A seaport town of Holstein, Prussia, on a fine bay of the Baltic. It has manufactories of iron, goods, and machines, tobacco, starch, and sugar, a good harbor, ship-building, a great navy-yard, arsenals, docks, and fortifications. Pop. 41,000.

Kiftis. Passenger-boats used on the rivers of India.

Kihaia. A Turkish officer of customs of high grade.

Kilderkin. A liquid measure containing two firkins, or from 16 to 18 gallons.

Kill. A narrow channel or arm of the sea.

Kill-devil. Spirits of poor quality; sometimes called *lightning* from the rapidity of its effects.

Killer. The name given to the grampus by whalers on account of its ferocity.

Killie-leepie (*Scotch*). The common sand-piper.

Killock. A small anchor for a boat, or a stone used as an anchor.

Kilty, A. H., Rear-Admiral U.S.N. Born in Maryland. Appointed from Maryland, July 4, 1821; first cruise, "Franklin," 74, Commodore Stewart, Pacific, 1821–24; store-ship "Decoy," West Indies, sloop "John Adams," Pensacola Station, frigate "Constellation," 1825–27; Brazil Station, frigate "Hudson," sloop "Boston," 1828–29; surveying coast of Louisiana, 1830–31.

Promoted to passed midshipman, April 28, 1832; schooner "Grampus," West Indies, 1832–34; receiving-ship "Sea-Gull," Philadelphia, 1835–36.

Commissioned as lieutenant, September 6, 1837; sloop "John Adams," East India Squadron, 1838–40; present at the attack on Qualla Battoo and Muckie, by Commodore Reid; "Columbus," 74, Mediterranean and Brazil, 1843–44; frigate "United States," coast of Africa and Mediterranean, 1846–49; rendezvous, Baltimore, 1851–52; receiving-ship "North Carolina," New York, 1854–55.

Commissioned as commander, September 14, 1855; commanding rendezvous, Baltimore, 1860; ordered to St. Louis, 1861, to aid in organizing naval flotilla under Foote; took command of gunboat "Mound City," and was engaged at Island No. 10 and Fort Pillow. The "Mound City" being sunk in the latter engagement, she was raised, repaired at Mound City, and rejoined the flotilla.

In June, 1862, was placed in command of an expedition to White River, Arkansas; on the 17th, attacked Fort St. Charles, about 100 miles from the mouth of the river, and, with the aid of military force under Col. Fitch, took it; but near the close of action a shot entered the steam-drum of the "Mound City," and the escape of steam caused the death of more than a hundred officers and men, the commanding officer receiving a severe scald, which caused the loss of his left arm.

Commissioned as captain, July 16, 1862; ordnance duty, Baltimore, 1863; command of iron-clad frigate "Roanoke," North Atlantic Squadron, and receiving-ship "Vermont," 1864–65.

Commissioned as commodore, July 25, 1866; command of Norfolk Navy-Yard, 1867–70. Retired November 25, 1868.

Commissioned as rear-admiral, July 13, 1870.

Died November 10, 1879.

Kimball, Sumner Increase, general superintendent of the U. S. Life-Saving Service. He was born in Lebanon, York County, Me., on September 2, 1834. He graduated at Bowdoin College in 1855, clerking and teaching school in the vacations to obtain funds to pay for his college course. Immediately after graduating, he commenced the study of law with his father, the Hon. Increase S. Kimball, one of the most distinguished lawyers in the State of Maine. He discontinued his law studies after a year, to occupy the position of commission clerk in the office of the Secretary of State at the capital of Maine. This position he resigned in the spring of 1857, and resumed his legal studies. He was admitted to the bar in 1858, and at once commenced the practice of his profession at North Berwick, Me. In September, 1859, he was elected representative to the State Legislature as a Republican, and although the youngest member of the house, took high rank in that body. In January, 1860, he accepted a first-class clerkship in the office of the Second Auditor of the Treasury, and successively passed through all the grades until he became chief clerk, now called deputy auditor. His recognized ability as an organizer in that office, which the war had increased from a *personnel* of 21 to more than 500, caused the Secretary of the Treasury, in 1871, to invite him to take charge of the Revenue Marine Service, which at that time was in a very unsatisfactory condition. This trust he accepted, and under his administration the service was almost revolutionized, the results appearing in a great diminution in the running expenses and the increase of its efficiency fivefold. He has twice been offered the position of chief clerk of the Treasury Department, which he declined. He consented, however, to act in that capacity during the short administration of Secretary Morrill, retaining charge at the same time of the Revenue Marine and Life-Saving Service. Connected with the Revenue Marine Service he found the nucleus from which he has developed the present Life-Saving Service. The establishment then merely consisted of a few buildings confined to the coasts of Long Island and New Jersey, designed for the storage of surf-boats and a few other meagre life-

saving appliances, intended for volunteer use on occasion of shipwreck by the local fishermen and wreckers. Both houses and apparatus had fallen into a state of dilapidation through neglect and depredation. There was no organization nor system connected with the establishment, and it was productive of comparatively little benefit. After personal inspection, Mr. Kimball took measures for the creation of an efficient service upon these coasts, and the proper appropriation having been procured, he increased the number of stations, and organized an effective corps of surfmen to man them. He furnished the stations with the latest life-saving appliances, and introduced the patrol system, by which the entire coast is placed under constant watch, and the immediate discovery of wrecks secured. The result of this organization for the first year was striking, not a life being lost by shipwreck upon either of these dangerous coasts. This fact caused the extension of the service to other portions of the Atlantic coast, where similar success followed, the final result being the formal establishment of the service upon all the coasts of the country, both ocean and lake, by the act of June 18, 1878, which also organized the Life-Saving Service into a distinct bureau, with Mr. Kimball at its head, detaching it from the Revenue Marine.

King Arthur (*Eng.*). A game sometimes played by sailors in warm climates. One, representing the king, allows water to be dashed upon him until another, by laughing, is forced to take his place.

King-crab. The *Limulus polyphemus*, a large crustacean in the form of a horse's foot. It is common in the West Indies.

King-fish. A large flat fish (*Lampris guttatus*) showing brilliant colors.

King-fisher. The *Alcedo ispida* of Europe and the *Alcedo alcyon* of America. It is a bird of gay plumage, inhabiting the vicinity of lakes and streams, and lives upon fish.

King's Bargain (*Eng.*). Refers to a sailor's merits, whether good or bad.

King's Bencher (*Eng.*). A man of many words and little work. A sea-lawyer.

King's Hard Bargain (*Eng.*). A worthless fellow.

King's Letter Man (*Eng.*). A former class of officers in the English navy, ranking with midshipmen, and holding a promise or letter that good conduct should be rewarded with a lieutenant's commission.

King's Own (*Eng.*). A term applied to all articles issued from the royal store-houses or magazines, and marked with a broad arrow.

King's Parade (*Eng.*). The quarter-deck.

Kingston, Ontario, is situated at the outlet of Lake Ontario, in lat. 44° 12′ N., lon. 76° 41′ W. The harbor is formed at the mouth of Cataraqui River, which here enters the lake. The west side is bold, and shipping of any size can lie here in safety. The city contains manufactories of iron-castings, machinery, steam-engines, locomotives, etc. Ship- and boat-building is carried on to a great extent, and vessels for both lake and ocean navigation are fitted out. Pop. 13,000.

Kingston, the principal commercial city and seaport of Jamaica, has a very fine harbor, which is a landlocked basin available for the largest ships, and is defended by several forts. Lat. 17° 58′ N.; lon. 79° 47′ 30″ W. Pop. 34,500.

Kingston. A shark (*Aquatina angelus*) having broad lateral fins, like a ray, whence it is also called *shark-ray*, *angel-fish*, etc. It is found in the North Atlantic. (Written also *king's-stone.*)

Kingston Valve. A valve for closing an orifice in a ship's side or bottom below the water-line. It is a conical-faced valve, fitted to a suitable seat and opening outwards, and so arranged that the outside pressure of water will close it when the force holding it open is removed. It is manipulated from the inside of the vessel by means of a stem passing through a stuffing-box.

Kink. A short curl or loop in a rope, and occasioned by an excess of lay or twist.

Kinkling (*Eng.*). A periwinkle.

Kinn (*Scotch*). Head or promontory.

Kintlidge. See KENTLEDGE.

Kippage. An obsolete term for the crew of a vessel.

Kipper. A salmon in the state of spawning. The word *kipper* originally denoted a salmon directly after the spawning season, and as fish in this state are not good for use while fresh, they were usually cured and hung up. Hence the word which properly denotes a spawning salmon came to be generally used for one that is salted and dried.

KIPPER-TIME (*Eng.*). The months during the year when the taking of salmon is prohibited.

Kismiss. A seedless raisin raised in India.

Kist. A Scotch pronunciation of chest.

Kit. A tub or basket used for fish. An outfit, either of tools required in a particular trade, or of clothing.

Kite. A fish of the genus Rhombus (*R. vulgaris*). Called also *brill.*

Kites. Lofty sails. See FLYING KITES.

Kittiwake. A gull found in high northern latitudes (*Larus tridactylus*).

Kitty-witch. A small kind of crab.

Kleg. A fish of the genus *Gadus barbatus.*

Kleptes. The Greek word for robbers. The term was applied to the corsairs of the Archipelago.

Klick-hooks. A peculiar kind of hook for catching salmon.

Klinker. A lighter or boat used on the coasts of Denmark and Sweden.

Klippen. A German word meaning cliffs.

Knag. The rocky summit of a hill. A knot in wood.

KNAGGY. Rough and knotty. Bad tempered.

Knap (Anglo-Saxon *cnæp*, a knob or button). The top of a hill.

Knar. A knot in wood.

Kneck (*Eng.*). The twisting of a rope as it is running out.

Knee. A timber of natural growth with two arms, nearly in shape of a right-angle, or a heavy iron bar bent to a similar shape. They are used to connect different beams and timbers in ship-building, and are named from the position in which they are placed. A *hanging* knee secures a deck beam to the side of the vessel, and is placed in a perpendicular position under the beam. A *lodging* knee is secured to the forward side of the beam, and to the vessel's side in a horizontal position, and a *lap* or *bosom* knee to the after side of the beam. A *dagger* knee is placed obliquely against the side of a vessel when

it would otherwise interfere with a gun-port. The *stern-post* knee is placed in the angle which is formed by the stern-post and keel.

KNEE-TIMBER. Timber that can be used for knees.

Knettar (*Eng.*). The string by which the mouth of a bag is secured.

Knife. Formerly used in the sense of sword or dagger.

Knight-heads. The timbers in a wooden ship which are bolted next to the apron or dead-wood, one on each side; they extend upward on each side of the bowsprit, the apron or dead-wood being sided large enough to admit of the bowsprit's being placed between the knight-heads.

Knittles. The small cords formed from the outside yarns of a rope with which a rope's end is pointed or grafted. See NETTLE.

Knocker. The name given to a kind of cockroach, from the noise that they make.

Knock off. To stop; to desist; as, to *knock off* talking.

Knoll (Anglo-Saxon *cnoll*). The round top of a hill, or the highest part of a shoal.

Knopp. See KNAP.

Knot. A bunch made in a rope or cord, either for ornament or use. They are made in the ends of ropes to prevent them from slipping or unreeving, by unlaying the strands and interweaving them in regular order; and are named either from the manner in which they are made, or the use to which they are applied, as *stopper* knot, *diamond* knot, *double-diamond* knot, *single* and *double wall* knots, etc. The ends of ropes are bent together by *square* knots, *single* and *double bends*, *fisherman's bend*, *Carrick bend*, etc. The log-line is divided into *knots*, each of which bears the same proportion to a mile as 30 seconds does to an hour. Hence, in speaking of a vessel's speed, *knots* are used, meaning nautical miles.

Knuckle. An angle made on some timbers either at the bow or the stern, such as at the counter- or stern-timbers, and the bulwarks which fall back from the line of the forward cant-timbers by a quick reverse of the shape, like a knee.

KNUCKLE-JOINT. A method of coupling shafts whose axes are not in the same straight line, but meet in a common point, by means of which power can be transmitted obliquely.

KNUCKLE-RAIL. A rail worked at the height of the knuckle.

KNUCKLE-TIMBERS. Those top-timbers in the forward or after body whose heads stand nearly perpendicular, or tumble home.

KNUCKLE-UNDER. To submit.

Kochab. The name of the star β *Ursæ Minoris.*

Koff. A Dutch coasting-vessel, fitted with sprit-sails, flying topsails, and jibs.

Koond. A cistern in India.

Kopeck. A Russian coin, .01 of a rouble; in value about two-thirds of a cent.

Korocora. A vessel with a high curved stem and stern, used by the Malays.

Koster. A kind of sturgeon.

Kota. Turpentine of East Indian production.

Koupang, or **Chobang.** A Japanese gold coin, equal in value to $3.57.

Kowdie, Kaurie, or **Cowdie.** A coniferous tree of New Zealand, valuable for spars (*Dammara Australis*).

Krabla. An Archangel whaling-vessel.

Kraken. A fabled Norwegian sea-monster of enormous size.

Krang, or **Kreng.** The carcass of the whale after the blubber has been removed.

Kreel, or **Creel.** A frame for taking salmon in Scotland. A basket used by anglers.

Kris, or **Crease.** A large dagger used by the Malays.

Kroo-men. A tribe of Africans on the west coast. They are employed on board of vessels for boat-service, where exposure to the heat of the sun would be injurious to foreigners.

Kyar, or **Coir.** Fibre of the cocoanut and the cordage made therefrom in India.

Kyle. A Scotch name for a small bay or creek.

L.

L. The three L's refer to lead, latitude, and look-out. The frequent use of the first, a correct knowledge of the second, and the faithful performance of the latter will generally insure safety in the vicinity of the coast. Of the letters used in the log-book to indicate the state of the weather, *l* denotes *lightning.*

Labarum. The standard borne before the Emperor Constantine, and afterwards applied to any flag or standard.

Labor. The heavy straining of a vessel caused by violent motion in a gale.

LABORSOME. Having a tendency to labor, on account of the cargo or fault in construction.

Labridæ. A family of osseous fishes, ranked by Cuvier in the order *Acanthopterygii*, by Müller in his artificial order, *Pharyngognathi.* The fishes of this family may be recognized by their oblong, scaly body, a single dorsal fin supported in front by spines, each of which is generally furnished with membranous appendages; the jaws are covered with fleshy lips, and the pharyngeal bones are armed with numerous and strong teeth, so disposed as to be especially adapted for crushing hard bodies and vegetable stems. The most valuable of the family is the Tautog (which see).

Labrus. A genus of fishes, several species of which are characterized by an elegant and regular oval form and beautiful colors; the wrasse.

Lace. To fasten with a cord or lacing. To beat or flog. *Gold lace* sewed upon the cuff denotes the rank of naval officers.

LACING. The cord or rope which is passed

through eyelet-holes in a sail to secure it to a stay, or to secure the edges of awnings or sails to each other.

Lace-piece. One of the principal pieces which compose the knee of the head in wooden ships; it is the upper piece, and the figure-head and head-rails are secured to it.

Lacerta. See CONSTELLATION.

Laches (Fr. *lache*). A term in law meaning negligence.

Lacquer. A varnish composed of gum-shellac dissolved in alcohol. Used upon lower decks and other unpainted wood-work.

Lacustrine. Pertaining to lakes.

Ladder. A frame consisting of side pieces connected by rounds or steps. A *Jacob's ladder* is made by inserting rounds, at regular intervals, through the lay of two ropes which serve as sides. They are used on lower booms, between the spar-deck and lower rigging, abaft the topgallant-masts when there are no ratlines upon the topgallant rigging, and over the stern of vessels for convenience in getting into or out of boats which are moored astern. Wooden ladders or steps are used for going from one deck to another, and are named from the hatchway or deck to which they belong. An *accommodation* ladder is a stairway extending from the gangway nearly to the water's edge, by which persons can gain access to a vessel from a boat.

Lade (Anglo-Saxon *lladan*). To load. Formerly used in the sense of *throwing out* or *bailing*.

LADEN. The condition of a vessel when loaded.

LADEN IN BULK. A cargo not in packages, but thrown loosely into the hold. Grain and salt are often carried in this manner.

LADING. Cargo.

Ladia. A Russian river-boat or lighter.

Ladle. An instrument for drawing the shell from a gun, or for handling hot shot. A small scoop used for dipping or handling liquids.

Ladron (Sp. *ladrone*). A rogue or thief.

LADRONE SHIP. A name given by the Chinese to a man-of-war or an armed vessel, probably on account of the roving character of armed junks.

Lag. One of the boards or staves forming the covering of the non-conducting material used on steam-cylinders, boilers, and steam-pipes.

LAGGING. The non-conducting covering which is placed upon steam-boilers and pipes to prevent the loss of heat by radiation.

Lagger. An idler or loiterer. (*Eng.*) One who is transported for crime.

Laggin. The extension of a barrel-stave beyond the heads.

Lagoon. A shallow lake connected with the sea. They are usually found on low coasts, or near the deltas of rivers, and also in coral islands where the water is supplied by channels or by the breaking of the surf over the reefs which separate the lagoon from the sea.

LAGOON ISLAND. An island formed by the coral insect, the peculiar feature of which consists of a narrow reef encircling a lagoon.

La Guayra is the principal seaport of Venezuela, on the Caribbean Sea, in lat. 10° 36′ 42″ N., lon. 66° 56′ 30″ W., closely surrounded by high mountains, except to seaward. Its trade is extensive, the chief exports being coffee, cacao, indigo, hides, cotton, etc. The harbor is not a very good one, the continued east winds keeping the water in a constant state of turmoil. The anchorage-ground, in from 6 to 30 fathoms according to distance from land, is very good. The town is defended by forts and batteries. Pop. 7000.

Lag-wood (*Eng.*). Wood from the large branches near the head of an oak-tree.

Laid. A name formerly given to the pullack by fishermen.

Lake. A lake is a large quantity of water contained in a hollow cavity in the earth's surface. Lakes, then, are nearly or entirely surrounded by land. A small lake is called a *pond*, in France an *étang*. A shallow lake near a coast is called a *lagoon*, and such in Ceylon are called *jeels*, and in Prussia *haffs*. Lakes in England are called *water;* in Ireland, *lough;* in Scotland, *loch;* in Italy, *valle;* in Holland, *meer;* in Hanover, Prussia, and Austria, *see*. A shallow lake, filled with vegetation, is called a *marsh*, or *morass*, and a large collection of such in Florida goes by the name of *everglades*. Ponds sometimes become lakes in times of great rainfall, especially in desert districts. Lakes are nearly everywhere abundant, and with them are connected some of the most remarkable phenomena of science. Anciently, many lakes were the habitations of primitive men, who built their villages on piles driven in them, and a tribe of Indians still build such villages in Lake Maracaybo, in Venezuela. Lakes are either salt or fresh. Those that have a considerable outlet are generally fresh, but the lakes of desert tracts are nearly always salt. The most remarkable salt lakes are the Dead Sea, Lake of Tiberias, Sea of Aral, Urumyeh in Armenia, and the Great Salt Lake of Utah. The quantity of salts furnished is frequently important, and bitumen, naphtha, petroleum, etc., are often derived from lakes.

Many lakes occupy the craters of extinct volcanoes, and many are at a great elevation above the sea. In most of the mountain ranges of the world are found such lakes. Others are far below the level of the sea, filling depressions often the result of volcanic, glacier, or earthquake action. Lakes also exist in caverns, far below the surface of the earth. They are often the sources of mighty rivers, and the waters of the Amazon, the Mississippi, and other great rivers find their beginning in small lakes. Lakes are often but the expansion of rivers, and the great American lakes are of this class, as are the Swiss lakes.

The finest scenery is often found near lakes, and the lakes of Killarney and the Swiss and Italian lakes are particularly celebrated for this. Some lakes are doubtless the remains of greater seas, as the Sea of Aral, formerly a part of the Caspian. Large lakes are particularly remarkable for their sudden and terrible storms. In Lake Constance a peculiar swell, called the *ruhss*, sometimes occurs without any apparent cause. Nonnenworth Lake, in the Black Forest, contains an island of floating turf, rising and falling on its bosom. A lake in Tunis completely evaporates during the dry season, leaving an incrustation of salt on the soil, gradually increasing in depth from an inch to a foot towards the centre. In the island of Trinidad is the celebrated Pitch Lake, boiling at its centre. Lake Jordan, in Friesland, is so completely covered by a vegetable growth that a wagon may be driven across it. The Zirkneh See, in Illyria, is

remarkable for emptying its bed in the summer, so that crops may be raised in it, and the holes by which the water leaves are seen, fish appearing with the return of the water. In North India a lake appeared in 1819 after an earthquake. Several lakes contain springs of mineral water, some hot water, and many salt lakes have fresh-water fountains in them. Lake Ala-Kal, in the Hindoo Koosh, contains an island volcano, and Lake Palte, in Thibet, is merely a circular ring about an island.

Switzerland, Finland, Sweden, and the northern half of North America are best provided with lakes.

Lake Ladoga is the largest in Europe. It contains 6300 square miles. It receives about 60 rivers and the waters of 2 other large lakes, Onega and Saima, pouring its waters into the Gulf of Finland by the Neva River. The lakes of Russia are very large.

Lake Baikal, in Asia, is one of the largest in the world, being 400 miles long and 60 broad. It is shallow, but is well stocked with fish and seal. Many of the high plateaus of Asia are evidently the beds of former lakes. Lake Urumyeh, in Armenia, is so salt that a storm covers the shores with foam to a great distance. The Dead Sea, famous in history, is particularly remarkable for the absence of all animal life, owing to its salts and to the petrifying character of its water. It is so salt that storms do not raise waves, and is 1300 feet below the sea, the greatest depression known.

The greatest lakes of the world are the six contained in the St. Lawrence Basin, containing 93,000 square miles, the largest being Lake Superior and the smallest St. Clair. The lakes of Africa are probably nearly as large, and give rise to the Nile, Zambesi, and other large rivers.

The five lakes occupying the plateau of Mexico are remarkable as having been the seat of civilization there. In Tezcuco was the ancient city of Mexico, and in these lakes are now floating gardens, islands of turf of great size, on which gardens are planted.

In South America, Lake Titicaca, 12,847 feet above the sea, was equally remarkable as the seat of Peruvian civilization. A temple on an island in it marks the former seat of Manco Capac, founder of the Inca kingdom.

Australian lakes are remarkable for their want of permanency, being very shallow, and sometimes drying up very suddenly.

Artificial lakes are numerous in Holland. Lake Moeris, in Egypt, was celebrated as having been constructed by one of the Pharaohs to contain and store up the surplus waters of the Nile inundation for a time of need.

France, Spain, and Portugal contain few lakes, and those very small; and the only lakes in Hindostan are the salt marshes near the coasts, called *runns*.—*F. S. Bassett, Lieutenant U. S. Navy.*

Lamantin. An old name for the *manatus*, or *sea-cow*.

Lambasting. The use of a rope's end as an incentive to action. (Probably a corruption of the obsolete word *lambskin*, to beat.)

Lamb's-wool Sky. The appearance of the sky when small circular clouds are seen.

Lamprey, or Lamper-eel. An eel-like fish of the genus *Petromyzon*, having a round, sucking mouth set with numerous minute teeth, and two large teeth on the palate. It was formerly esteemed a great delicacy, and is still eaten. The European sea lamprey is *P. marinus;* the American, *P. Americanus.* The river lamprey is *P. fluviatilis.*

Lamp-shell. A common name for the *Terebratula* of zoology.

Lancaster Gun. See ORDNANCE.

Lance-corporal. A private who performs the duty of corporal.

Lanchang. A Malay proa, or swift-sailing boat.

Land. The earth as distinguished from the sea. The space between the grooves in a rifled gun. The lap of the planks in lap-jointed work. *To land* signifies to set foot on shore, also to place any object; as, "To land a yard on deck." *To make land* means to sight it. *To shut in the land* is to lose sight of it by reason of fog or intervening land.

LAND-BLINK. The peculiar brightness in the atmosphere which is seen in the Arctic regions when in the vicinity of land covered with snow.

LAND-BREEZE. The wind which blows from the land during the night in the tropics. See BREEZE.

LAND-FALL. A good land-fall is made when land is sighted with the bearing and distance previously expected. It is the proof of the correctness of the navigator's work, whereas a bad land-fall would indicate errors in a vessel's navigation, or the effect of unknown currents.

LAND-HO! The cry that is given when land is first seen.

LAND-ICE. Ice that extends out from the shore.

LANDING. A pier, wharf, etc., where passengers are landed.

LANDING-STRAKE. The second strake or plank of a boat from the gunwale.

LANDING-SURVEYOR (*Eng.*). A grade of custom-house officer who superintends the landing-waiters.

LANDING-WAITER (*Eng.*). An officer of customs who attends to the landing and inspection of goods subject to duty.

LAND-LOUPER (*Dutch*). A vagabond or vagrant.

LAND-LUBBER. A sailor's term of contempt for one who lives on shore.

LANDMARK. Any object on shore serving as a guide by which to enter a harbor, or by which the land may be recognized.

LAND-SHARKS. The class of people in seaports who subsist by defrauding sailors of their money.

LAND-SLIP or LAND-SLIDE. The sliding of a quantity of land on the side of a mountain.

LANDSMAN. A rate in the navy which includes persons who have no knowledge of the duties of a seaman.

LAND-TURN. A land-breeze.

Landing-parties. The organization of landing-parties is outlined in the Ordnance Instructions, but the details are left to commanding officers, as they have to be varied to suit the circumstances under which a landing is to be made. In well-organized ships something similar to the following obtains.

For expeditions at a distance from the ship, where the journey has to be performed by water in the ship's boats, what is called the organiza-

tion for "distant service" is followed. The boats are manned by their "fighting crews." Each boat carries, besides, a number of marines or good marksmen to act as riflemen. As supplies and extra ammunition have to be carried, the boats, to be perfectly serviceable, must not be overloaded. Each fighting division of the ship mans two boats, one large and one small one, the officer of the division commanding the section going in the larger boat, one of his aids or a petty officer having charge of the other. In the boats carrying howitzers or machine-guns there is an extra officer, who acts as chief of piece. The boats are all numbered, and are arranged so that when in line the artillery will be on the flanks, and that the two boats commanded by a division officer shall be together. The steam-launch, or cutter, is not assigned a permanent position in the line. This boat is assigned to the commanding officer of the expedition, and carries a machine-gun. In moving long distances she takes the other boats in tow, the latter being formed in column of boats. Oars and sails should be used in the boats when possible, to assist the tow.

The equipment of the boats and men must vary, of course, with the service to be performed. On civilized and armed coasts a boat expedition would rarely be attempted, but on uncivilized or unarmed coasts great advantages are derived from them when properly carried out.

We will assume that an expedition is to be sent from a ship of the class of the "Pensacola," to operate 50 miles up a river against an Indian village. The "Pensacola" is provided with a steam-launch, a sailing-launch, three cutters, a cutter-barge, two whale-boats, a gig, and two dingeys. It has been decided, for example, that it will be safe to send all the boats away from the ship; if it had not, one or more divisions, with their boats, could have been left behind. It is supposed that the raid can be accomplished in two days, but an extra day's stores are to be carried in case of accidents. The boats are assigned to the divisions as follows: 1st division, sailing-launch and 3d cutter; 2d division, 1st cutter and 1st whale-boat; 3d division, 2d cutter and 2d whale-boat; 4th division, barge and gig; hospital-boat, 1st dingey, the 2d dingey being left for ship's use. The steam-launch is manned from the master's division. The sailing-launch and 1st cutter carry howitzers, the steam-launch, a Gatling.

The boats are supplied for pulling and sailing, and are furnished with anchors, or grapnels, and cables. Provisions (cooked) are carried for three days; the coffee roasted and ground, ready for use. Water is carried for five days. The howitzers are supplied with 80 rounds of assorted ammunition; more should be carried if stowage room can be found. The field-carriages are taken if the guns are to be landed. It will generally be found best to take one at least. Spare sponges and rammers are necessary. The men are armed with rifles and sword-bayonets, except the 8 lower numbers of the guns' crews, who are armed with cutlasses. Each man carries 40 rounds of ammunition, and 1000 rounds of spare ammunition is carried in each boat. Pea-coats and blankets are carried by all. Care is taken that the men are well supplied with tobacco. If wet weather is anticipated oil-skins are taken, and a change of clothing; plenty of tarpaulins are also supplied with which to cover the stores, ammunition, and clothing. Each boat carries a kettle to boil coffee, and each person a pot, pan, and spoon. The boat-boxes, with tools and materials for slight repairs, flint and steel, fish-hooks and lines, lead and line, lantern and candles, etc., are carried. Boat-compasses and glasses are distributed as far as they will go. The steam-launch is supplied with a set of signals, and the boats with answering pennants. The surgeon, with his instruments and medicine-chests, embarks in the hospital-boat.

The marines are distributed among the lighter boats, and a few of the best shots are detailed for the others. Every officer is provided with a full list of what he must take in his boat, and when the order is passed to fit out he collects all his material, and inspects it thoroughly. He then inspects his men fully armed and equipped. Having seen that his boat is completely provided, he has her stowed, and then manned, and when ready reports for service. When all the boats are ready, line is formed, and the senior officer inspects his flotilla. Column is then formed, and the steam-launch takes up the tow. A few oars in each boat are kept going, and, if the wind is favorable, sails are set.

In moving up the river care is taken not to be ambushed. Scouting-parties may be landed, if favorable eminences are near at hand, from which the banks may be viewed ahead. If attacked in force in a narrow river a fight should be made, and the advance continued after the enemy is repulsed; in a broad river it may be safe to run by the enemy if he is unprovided with boats. Care should be taken to destroy all boats which may be discovered on the way, as they might be used to cut off a retreat. If it is found necessary to land to cook the coffee, one boat only should be detailed for the work, the others lying off ready for a surprise. If the regulation boat-stoves have been provided for the larger boats, the cooking may be done without landing. Having arrived within shelling distance of the town, a well-directed slow fire should be opened on it. The howitzer-boats should take up commanding positions; the lighter boats, after the beach or landing has been cleared, should move in and land their men, with the exception of those detailed as boat-keepers, the steam-launch with the Gatling moving close in to cover the landing. If possible, the work of destruction should be carried out by this party. It may be found necessary to send in some of the heavier boats, but all should not be landed, except in a great emergency. The object of the expedition having been accomplished, the people should embark, and return to the ship as soon as possible, using the same precautions as in advancing.

For expeditions away from the ship, where the service has to be performed by land, the ship's battalion, or part of it, should be employed. As in the previous case, we will take the "Pensacola" as our example, and give her organization just as it stands.

The battalion is commanded by the executive-officer, and consists of four companies of blue-jacket riflemen, one company of marines, a platoon of howitzers, a Gatling section, an ammunition squad, a provision squad, a pioneer corps, a hospital detachment, and a band, whose members in the field act as aids to the wounded.

The rifle companies are the 1st, 2d, 3d, and 4th divisions of the ship's organization, the last being augmented by a detail from the powder division. The division officers command their own men. Each company numbers 36 men, including 2 guides and 2 file-closers. This leaves a number of men unassigned in each division.

The crew of No. 1 gun, 1st division, forms the crew of the Gatling. The first 12 men of No. 2 gun, 1st division, form the crew of No. 1 howitzer. The first 6 men of No. 5 gun, 2d division, and the second 6 men of No. 6 gun, form the crew of No. 2 howitzer.

The supply squads are taken from the different divisions. The pioneer corps from the engineer division. The medical detachment consists of the apothecary and several stretcher-men.

The men and officers, when fully equipped, carry blankets rolled, in which, if necessary, extra clothing and shoes are packed; a haversack, made of canvas aboard ship, in which are carried eating-utensils, rations, tobacco, and spare ammunition; a water-bottle, made by covering old bottles with flannel and securing a shoulder-sling to them; and canvas leggins, made by the men themselves. In cold weather pea-coats are added. For long expeditions the hammock, unslung and fitted with side eyelets, would be carried rolled over the blanket, for use as a shelter, several being laced together to form a tent, or to be placed under the men on the ground, or slung between poles as cots. They would also furnish cover to the men when throwing up rifle-pits, and could be used, in combination with poles, for hand-barrows or stretchers. Each man has a waist-belt, on which the riflemen carry a cartridge-box and bayonet. On actual service the cartridge-box would be replaced by an improvised prairie-belt. The cannoneers and supply-squad men wear cutlasses, to which the latter add a pistol. The officers wear their swords, and revolvers with cartridge-boxes. The officers are ordered besides to carry glasses, pocket-compasses, paper, pencil, etc., and, if possible, a sketched map of the ground to be operated over. The supply-squads are furnished with carrying-poles, on which are slung ammunition-boxes, or mess-kettles, and packages of supplies. The hospital detachment has two complete field-stretchers and a carrying-pole for the medicine-chest. These men carry no arms, and wear a "red cross" arm-badge. A small "red cross" hospital flag is carried by one of the detachment. The pioneer corps consists of 12 men, commanded by an engineer officer; they are armed with rifles without bayonets, and each man carries slung over his shoulders two tools. The tools include shovels, picks, crows, axes, hammers, cold-chisels, etc.

Only one howitzer is intended for landing for distant service; the second carriage is fitted as a limber, and used for carrying an extra supply of ammunition, a spare wheel, some tools, and a coil of rope. Both crews man this howitzer, and the infantry companies assist over heavy ground. The Gatling is taken, an extra tank of ammunition being slung to the carriage. The admiral's and captain's coxswains carry the national colors and a battalion flag (a jack, with the name of the ship in the centre). The markers, who also act as signal-men, carry hand-signal flags.

When the battalion, or any part of it, is landed, the boats are towed by the launch as much as possible. Regular boat-keepers under an officer are detailed for all the boats from men not belonging to the battalion.

There is another variety of landing-party, which, although not intended for war purposes, would seem to come appropriately within the limits of this article; it is the fire-brigade. All well-organized ships have such an organization, intended for landing to assist in extinguishing fires on shore, or to be sent to vessels on fire. The company organization, when the companies are taken from the same divisions, is the best, one company being equipped as wreckers, with axes, picks, shovels, crows, grapnels and chains, and Jacob's ladders, another as bucket-men. If there are efficient handy-billies, they may be fitted on the howitzer field-carriages, and taken in charge of the artillery-men. The fire-extinguishers should be carried by reliable men, and a supply of tarpaulins will be found useful.—*Theo. B. M. Mason*, *Lieutenant U.S.N.*

Lane. A passage through ice, or through a crowd.

Langrage, or Langrel. A projectile which was formerly used for the purpose of injuring the sails and rigging of an enemy's vessel during action. It consisted of various pieces of iron bound together, with sufficient size to fit the bore of the gun.

Languet (Fr. *languette*). That part of the hilt of a sword that overlaps the scabbard.

Laniard, or Lanyard. The rope which connects the upper and lower dead-eyes of standing rigging, and by which the rigging is *set up* or tightened. The laniard serves as the fall of a tackle, the dead-eyes being used in place of blocks. A *lock-laniard* is the long string attached to the lock of a gun, by which it is fired. A *port-laniard* is a line by which a port is closed, and by which it is held in position when *square* or extended parallel with the water. Each port is fitted with two laniards. A *knife-laniard* is the white cord or braided line worn about the neck, and to which the knife is attached, to secure it from falling from aloft, and the word is applied to any small line used for a similar purpose. A *bucket-laniard* is the rope handle of a bucket.

Lantcha. The name of a Malay vessel.

Lantern. A large light which vessels are required by law to exhibit from sunset to sunrise, when they are under way. A vessel under steam has a lantern at the foremast head, which shows a white light, and vessels whether under steam or sail carry *side-lanterns*, that on the starboard bow being green, and on the port bow red. The white light is required to show its rays over an arc of 20 points of the compass, or 225°; while the side lights each show their rays over an arc of 10 points, or 112° 30′. By means of this arrangement of lanterns the general direction in which a vessel is steering may be known to others, and by following the "Rule of the Road" the danger of collision is usually avoided. *Signal-lanterns* are used in communicating between ships of war, and are of the three colors, red, white, and green. *Battle-lanterns* are made of a frame-work of copper, in which glass slides are placed. They are hung in the rear of the guns on a covered deck during an action at night.

Lantern-brace. The iron fixture or rod by which a lantern is secured.

Lantern-fish (*Eng.*). The sole.

Lantione. The name of a Chinese row-boat.

Lap. The amount which a slide-valve extends over the ports when in mid-position, when working steam expansively. It acts by closing the port before the piston arrives at the end of the stroke; this is called steam-lap, and necessitates lap on the exhaust side, called exhaust lap, to prevent the steam being exhausted too soon.

Lapel, or Lapelle. Part of a coat. Previous to 1812 the white lapel denoted the rank of lieutenant in the English navy.

La Pérouse (Jean François de Galoup, Comte de), the celebrated and unfortunate French navigator, was born in 1741, and died in or near the island of Vanikoro at an uncertain date, supposed to be during the year 1788.

La Pérouse entered the French navy at 15, and was at once actively employed, being wounded and made prisoner at the action of Belle Isle, in 1759. Soon exchanged, he returned to duty. Was made ensign in 1764, and *lieutenant de vaisseau* in 1775, when he distinguished himself, in command of the "Amazon," by the capture of the English frigate "Ariel."

In 1782 he commanded at the destruction of the Hudson Bay establishments, previous to which he had made many captures of English vessels, and had been promoted to captain.

In 1785 the French government, stirred by the discoveries of Cook and other explorers, wished to take part in the survey of unknown seas thus happily commenced; and an expedition was resolved upon to search for the northwest passage, and to explore the Japan Sea, the Solomon Islands, and the southwest part of New Holland. Besides scientific purposes, the expedition was to have commercial aims, especially in the development of the fur-trade and the whale-fishery. The field thus blocked out proved too extensive, and the instructions for the voyage, drawn up under the directions of Louis XVI. himself, were entirely too minute and complicated.

The appropriately-named frigates "Boussole" and "Astrolabe," the latter under Capt. de Langle, were fitted out with every instrument and appliance known at that day, and had a full corps of scientific men and artists. The two vessels sailed from Brest on the 1st of August, 1785, and, after touching at various points in the Atlantic, doubled Cape Horn and put in at Concepcion, Chili. Proceeding thence to Easter Island and the Sandwich Islands, they sailed for the American coast, in the neighborhood of Mount St. Elias. Here bad weather and other causes prevented him from doing much work. Indeed, it took Vancouver three years to make an incomplete reconnoissance of these shores. Abandoning the northwest course, La Pérouse coasted down to Monterey, and then struck across for the Japan Sea, discovering islands and reefs on the way.

In January, 1787, he was at Macao. Sailing thence he touched at the Philippines, and reconnoitred Formosa, and in May reached the Corean Strait, of which country, as well as Japan, little or nothing was then known. Then followed a laborious exploration of the coast of Tartary, Japan, and the Kurile Islands, during which many bays, islands, and straits were plotted and named, he being the first to recognize the separation of Saghalien from Japan.

In September, 1787, the expedition was at St. Peter and St. Paul, in Kamschatka, where it was, by the order of the Empress Catherine, well entertained. Here they received dispatches, and sent home reports and charts. Soon at sea again, La Pérouse searched in vain for a large island laid down in the old Spanish charts to the eastward of Japan.

On December 9 he reached the Navigator group,—lovely islands, with ferocious inhabitants. Here Capt. de Langle and 11 men were killed by the natives, and 20 wounded. Without making reprisals, La Pérouse went on to the Friendly Islands, and thence to Botany Bay, where he arrived in January, 1788. The expedition sailed from Botany Bay in the latter part of February, and from that time forty years elapsed before any trace of them could be discovered.

The French Revolution, with its entire upheaval of social and official life, prevented any action in regard to them until 1791, when a decree of the National Assembly ordered a search. In the same year Admiral d'Entrecasteaux sailed upon the mission. He had no success in his search, passed within a short distance of Vanikoro without touching there, and died during the voyage. Nothing more of any moment was done until 1826–28, when the English Capt. Dillon and the French navigator Dumont d'Urville each went over the ground where information as to the fate of La Pérouse was supposed to be accessible.

On the island of Vanikoro, or Pitt's, in lat. 11° 36′ 30″ S., and lon. 166° 53′ 24″ E., some traces of the French discovery ships were found. According to the reports the two vessels must have been lost on the reefs surrounding the island. The crew of one of them were, after a fight, all massacred. Those of the other ship purchased peace with some goods saved, and then built a small vessel from the wreck of their own. In this they left the island, never to be heard of again. They left a few of their number behind in the service of the chiefs, but they were all dead when the searchers arrived. All the articles which Dillon recovered from the wrecks form a pyramid in the marine department of the museum of the Louvre.—*E. Shippen.*

Lap-joint. The method of joining the plates in iron ships and in boiler construction; there are two kinds, double and single riveted lap-joints; their relative strength as compared with the plate is as follows: entire plate 100, double-riveted joint 70, single-riveted 56.

Lapland Witch. A Laplander who professes to have the power to make the wind blow fair or foul.

Lapping. The name given to thin ice in the Arctic Seas where one piece overlaps another. The sound made by ripples breaking against the shore.

Lap's Course. See Lob-scouse.

Lap-sided. A term expressive of the condition of a vessel when it will not float or sit upright in the water. Lop-sided.

Lap-streak. A term used in boat-building to denote that the planks overlap.

Larboard. The left side of a vessel when facing towards the bow. On account of the re-

semblance of the word to *starboard*, and the consequent liability to mistake, *port* has been substituted, and is now in general use.

LARBOARD WATCH. The former name for *port* watch, one division of the crew of a vessel.

LARBOLINES. Formerly, a name given to the men of the larboard watch.

Lardner, James L., Rear-Admiral U.S.N. Born in Pennsylvania. Appointed midshipman from that State, May 10, 1820; served in the schooner "Dolphin" and ship "Franklin," 80 guns, flag-ship Commodore Stewart, Pacific Ocean, in 1821–24; August, 1825, joined frigate "Brandywine," and sailed to France, carrying to his home Gen. Lafayette, "the Nation's Guest." Sailed afterward to the Mediterranean, and returned to New York in 1826. October, 1826, sailed in frigate "Brandywine," flag-ship of Commodore Jacob Jones, to the Pacific Ocean, and served in that ship, schooner "Dolphin," and ship "Vincennes" until June, 1830, —nearly three years of which as navigating-officer of the latter ship, in which he circumnavigated the globe in 1829–30.

Commissioned as lieutenant, May 17, 1828. Summer of 1832, served as senior lieutenant in schooner "Experiment"; 1833–34, served in the "Delaware," 86 guns, flag-ship of Mediterranean Squadron, Commodore Patterson. April, 1837, ordered to "Independence," 60 guns, flag-ship of Brazil Squadron, Commodore Nicholson, and served in Russia, England, and in Brazil, 1837–38. In the years 1841–44 served as senior lieutenant in sloop "Cyane" and frigate "United States," flag-ship of the Pacific Squadron, nearly three years in the latter ship. Commanded receiving-ship, at Philadelphia, in the years 1845–48. May, 1850, sailed in command of brig "Porpoise" to the coast of Africa, and made a cruise of three years in command of that vessel and the sloop-of-war "Dale," returning to Boston in April, 1853.

Commissioned as commander, May 17, 1851. Served as fleet-captain of the West India Squadron, in the summer of 1855. 1860, ordered to the Philadelphia Navy-Yard.

Commission as captain dated May 19, 1861. September, 1861, ordered to command the steam-frigate "Susquehanna," North Atlantic Blockading Squadron; was with Dupont at the capture of Port Royal and blockading South Carolina and Georgia, for which service his name was sent to Congress by President Lincoln, for a vote of thanks, which passed the House, but was thrown out in the Senate. After the battle of Port Royal, Capt. Lardner received a complimentary letter from Flag-Officer Dupont, of which the following is a copy:

"WABASH, OFF HILTON HEAD,
PORT ROYAL, S. C., November 9, 1861.

* * * * * * * * *

"I inclose a general order, to be read to the officers and crew of the 'Susquehanna,' and I take the occasion to say that your noble ship, throughout the whole of the battle, was precisely where I wanted her to be, and doing precisely what I wanted her to do, and that your close support of this ship was a very gallant thing.

"Truly your friend,
(Signed) "S. F. DUPONT.

"Capt. J. L. LARDNER,
Commanding 'Susquehanna.'"

May, 1862, assumed command of the East Gulf Blockading Squadron, with the flag of rear-admiral. Returned home in December, invalided by a severe attack of yellow fever at Key West. Admiral Lardner lost, by yellow fever, 40 gallant officers and men, from his flag-ship, in the summer of 1862. In May, 1863, took command of the West India Squadron; squadron withdrawn, October, 1864. Retired November 20, 1864.

Commissioned as commodore, July 16, 1862.

Commissioned as rear-admiral, July 25, 1866. On special duty from 1864 to 1869. Governor of Naval Asylum, Philadelphia, 1869–71.

Large. Said of the wind when it is fair, so that the sails receive its full effect. A vessel is then said to *sail large*. *By and large*, "at all points." See BY.

Lark. A frolic.

Larrup. An old word meaning to flog.

Lascar. A native East Indian sailor employed on European vessels.

Lash. To secure with a rope or lashing.

LASH AND CARRY. The order given to the watch below when it is called at night, meaning that the hammocks are to be lashed and stowed in the nettings.

LASHING. A rope used to secure a movable object, or to fasten one object to another.

LASHING EYES. Eyes or eye-splices made in the ends of a rope by which they may be lashed together.

Lasher Bull-head (*Eng.*). The *Cottus scorpius*.

Lask. An obsolete term for sailing with the wind aft.

Laskets. Small loops made of cord for lacing one sail to another, as the bonnet to the jib.

Last (*Eng.*). A cargo. A weight which varied with different articles, but was generally estimated at 4000 pounds. A last of herrings or cod-fish was 12 barrels, of gunpowder 24 barrels, and of pitch or tar 14 barrels.

LASTAGE (*Eng.*). The duties paid upon such articles as were bought and sold by the last. Also a term which was used to denote the cargo of a vessel.

Laster (*Eng.*). The flow of the tide

Latching Key. The centre loop or lasket which serves as a key to the rest, and prevents them from unreeving. See LASKETS.

Lateen-sail. A triangular sail used on native vessels from the northern coast of Africa and Turkey, and seldom seen but in the Mediterranean. It is bent to a long tapering yard which hoists to a comparatively short mast, the halliards being secured to the yard at one-quarter of the distance from the forward or lower end.

Lateen-yard. The yard to which a lateen-sail is bent.

Lateral Resistance. The resistance of the water against the side of a vessel in a direction perpendicular to her length.

Lates (*Lates Niloticus*). A fish of the perch family, one of the most delicate and best-flavored fishes of the Nile. It grows to a large size, sometimes 3 feet long. It is mentioned by several ancient authors. In form it resembles a perch. Another species of this genus is the *Vacti*, called *Cock-up* by the English in Calcutta, one of the most esteemed fishes of the Ganges, which it ascends as far as the tide does.

Lathe. The name of a cross-bow used in the early days of the English navy.

Lather. To beat soundly.

Latitude. The latitude of a point on the earth's surface may be defined as its angular distance from the equator measured on a meridian. This is the geographical latitude as found by astronomical observations, and if the earth were a sphere would coincide with the geocentric or true latitude, which is an angle formed between a line drawn from the place in question to the centre of the earth and the plane of the equator.

The difference between the two latitudes is not great, but enters into the rigid determination of longitude by the method of lunar distances, as well as into other astronomical problems. This correction has, therefore, been tabulated for use in such cases. It is called the *angle of the vertical*, and attains a maximum of 11′ 30″ at the latitude of 45°.

The direction of the centre of the earth can only be determined by the plumb-line, or by the perpendicular to a fluid surface.

Astronomical or geographical latitude is determined in many ways. At sea, the methods most in use are the measurement of the altitude while on the meridian of a celestial body, the declination of which is known, and by the determination of two lines of equal altitude by what is called Sumner's method. (See NAVIGATION.) On shore, latitudes can be determined with great exactness by numerous methods. Besides the methods in use in fixed observatories, there are three of great precision in use by surveyors, viz., by circum-meridian altitudes of stars, by either the common or the prismatic sextant and the artificial horizon, by measurement of the difference of zenith distance of pairs of stars with the zenith telescope, and by observations of the transit of stars over the prime vertical. (See Chauvenet's "Spherical and Practical Astronomy.") —*F. M. Green, Lieutenant-Commander U.S.N.*

LATITUDE BY ACCOUNT. The latitude deduced from the course and distance sailed since the last observation.

LATITUDE BY OBSERVATION. The latitude deduced from an observation of a heavenly body.

LATITUDE (TERRESTRIAL), PARALLELS OF. Lesser circles of the sphere parallel to the equator.

LATITUDE, DIFFERENCE OF. The difference of latitude of two places is the arc of a meridian included between their parallels of latitude.

LATITUDE OF A HEAVENLY BODY. The angular distance of the body from the ecliptic.

LATITUDE (CELESTIAL), CIRCLES OF. Great circles of the celestial sphere passing through the poles of the ecliptic; so called because latitude is measured upon them.

LATITUDE (CELESTIAL), PARALLELS OF. Lesser circles of the celestial sphere parallel to the ecliptic.

LATITUDE, HELIOCENTRIC AND GEOCENTRIC (Gr. *helios*, the sun; *gē*, the earth; and *kentron*, the centre). Terms applied especially to the planets. The distance of the planets from the earth is small compared with that of the fixed stars, and hence the place of any one of them on the celestial sphere varies with the position of the spectator in different parts of the earth's orbit. Thus, viewed from the earth as centre we have the geocentric place of a planet and the corresponding geocentric latitude and longitude. On the contrary, if viewed from the sun as centre we have the heliocentric place of the planet, and the corresponding heliocentric latitude and longitude. The geocentric differs from the heliocentric place of a planet by reason of that parallactic change of apparent situation which arises from the earth's motion in her orbit.

Launce (*Eng.*). From the Danish word *loens*, exhausted. A term used when the pump sucks.

Launch. The heaviest boat in a ship of war. Each ship usually carries two launches,—one a steam-launch and the other a sailing-launch. The former is fitted for the use of torpedoes, and is of great utility in towing the remaining boats of a vessel, or in making trips of considerable extent from the vessel. The sailing-launch is sloop-rigged, and is also fitted with 16 oars. A howitzer is carried in the bow, and by means of a field-carriage it can be landed and used as light artillery. Boats of this class are used for heavy work, such as carrying stores or laying out and weighing an anchor in shoal water, and also in expeditions against an enemy's coast or small vessels.

To launch *a vessel* is to cause it to slide from the ways upon which it has been built into the water. To *launch a spar* or any heavy object is to push or slide it. To *launch a topgallant-mast* is to slack the mast-rope and allow the weight of the mast to be supported by the fid, after the mast has been swayed aloft.

LAUNCH-ENGINE. A small engine for propelling a steam-launch, usually similar in construction to the ordinary marine-engine, though sometimes the boiler and engine are attached for compactness.

LAUNCHING-RIBBAND. An oak plank bolted to the outside of the launching-ways to guide the cradle in its descent in launching.

LAUNCHING-WAYS. A platform built upon each side of the ship, whereon the bilge-ways slide in the process of launching.

La Vallette, Jean Parisot de. Forty-eighth grand master of the Knights of Malta. Born 1494, died 1568.

Always prominent in the order, La Vallette was especially distinguished for great courage and ability in constant war with the Turks. He became governor of Tripoli, grand prior of St. Gilles, and of the "Langue de Provence," and lieutenant-general under the grand master, Claude de La Sangle, at whose death, in 1557, La Vallette was thought most worthy to succeed to the grand mastership. He at once instituted needed reforms, exercising his power freely in the interests of the order; making the priors and commanders of the German and Venetian branches pay their arrears of tax, restoring military discipline, which had become very lax, and increasing very considerably the fleet of the order.

Desiring to recapture Tripoli, which had been abandoned to the Turks, he allied himself with the viceroy of Sicily, but owing to the misconduct of the latter the expedition became a failure.

La Vallette had, however, better success in his contests with the Turkish fleet, of which he captured a very large number in various engagements. This so enraged Solyman II. that he resolved to attempt the capture of Malta, and, to this

end, made extensive preparations. In 1565 Malta was besieged by 40,000 Turks in 200 vessels. La Vallette, in his arid and unproductive island, resisted this formidable attack in the most heroic manner for more than four months, when reinforcements arrived and the Turks were forced to raise the siege.

Having saved Malta, he proceeded to make it impregnable, and, in addition to the well-known defensive works, built the new city, which still bears his name, and which is not very much altered in appearance at the present day.—*E. Shippen.*

Laver. The leaves of an edible seaweed.

Lavy. The name of a sea-bird which frequents the Hebrides, and whose movements are believed by the inhabitants to indicate changes of weather.

Law, Richard L., Captain U.S.N. Born in Indiana; appointed midshipman, 1841; "Delaware," Brazil Station, 1841–43; "Lawrence," Home Station, 1843–45.

Promoted to passed midshipman, 1847; "Perry" and "Brandywine," Brazil Station, 1847–50; coast survey, 1851–53.

Commissioned as lieutenant, 1855; "Constellation," Mediterranean Station, 1856–57; Naval Academy, 1858–59; "Hartford," Asiatic Station, 1859–61.

Commissioned as lieutenant-commander, 1862; commanding "Clifton," West Gulf Blockading Squadron, 1862–63; three engagements at Galveston, and one at Lavacca; store-ship "New Hampshire," South Atlantic Blockading Squadron, 1865–66.

Commissioned as commander, 1866; receiving-ship "New Hampshire," 1866–67; "Tacony," North Atlantic Station, 1867; "Suwanee," North Pacific Station, 1868; "Ashuelot" and "Iroquois," Asiatic Station, 1868–70; navy-yard, Philadelphia, 1871–72; Naval Asylum, 1873–74; "Dictator," North Atlantic Station, 1874–75; Bureau of Yards and Docks, 1877–78; chief of Bureau of Yards and Docks, 1878–81.

Commissioned as captain, 1879.

Law of Nations. The code of laws by which the intercourse between different sovereign states is regulated. "It consists of those rules of conduct which reason deduces as consonant to justice, from the nature of the society existing among independent nations, with such modifications and deviations as may be established by general consent." See INTERNATIONAL LAW.

Lawrence, James, Captain U.S.N., was born October 1, 1787, at Burlington, N. J. Appointed midshipman September 4, 1798, he served in the "Ganges," Capt. Tinghey, and in the "Adams," Capt. Robinson. When the navy was reorganized he was still named as midshipman (1801). He was soon after promoted to lieutenant, and went to the Mediterranean in the "Enterprise." He distinguished himself in an attack on boats in Tripoli harbor, led by Porter, and was engaged in the destruction of the "Philadelphia," in the ketch "Intrepid," February 15, 1804. He was first lieutenant of the "Constitution" in 1808, commanded the "Vixen," 14, in 1809, the "Wasp," 18, in 1810, and the "Argus" the same year. He was promoted to master commandant in 1811, and commanded the "Hornet," 18. He went twice to Europe with dispatches, and sailed for the West Indies in Commodore Rogers's squadron in June, 1812; captured a letter of marque and the brig "Resolution," and on the 24th of February, 1813, the British sloop "Peacock," 18, after a sharp engagement of thirty minutes. For this he was promoted to captain, given a medal, and the command of the frigate "Chesapeake." On the 1st of June, 1813, he engaged the British frigate "Shannon" off Boston harbor. Capt. Lawrence was soon wounded, exclaiming, as he was carried below, "Don't give up the ship!" Weakened by losses and by disaffection among the crew, his ship was captured by a boarding-party and carried to Halifax, where Capt. Lawrence was buried, having died on the way, on the 6th of June, at the age of 32. He was a fine seaman, brave, chivalrous, and just.—*F. S. Bassett, Lieutenant U.S.N.*

Lay. A share in the proceeds of a whaling voyage paid to each of the crew instead of monthly wages. The direction given to the strands of a rope in laying it up. *To lay* is used in the sense of to *go* or *come*; as, *lay forward*, *lay down from aloft*, etc. *To lay a gun* is to point it at an object. *To lay up a rope* is to twist the strands together. *To lay on oars* is to cease rowing, and keep the oars parallel with the water. *To lay in stores* is to take provisions on board. A ship *lays her course* when being close-hauled, the wind permits the desired course to be steered. *Lay to.* (See LIE TO.) *To lay up a vessel* is to dismantle her.

LAY-DAYS. The number of days specified in a charter-party which are allowed for the loading and unloading of a vessel, and beyond which a certain sum per diem, called demurrage, must be paid for the detention.

LAYING DOWN. The delineation of the different parts of a ship to their full size upon the mold-loft floor.

Lay-lords (*Eng.*). The civil members of the board of admiralty.

Lazaretto. A hospital for the treatment of infectious diseases. A place near the stern in some merchant vessels where provisions are stowed.

Lazy-bars. Bars of iron temporarily placed across the mouth of a furnace to support the fire-irons in working at the back end of a furnace.

Lazy-guy. A light rope or tackle used for steadying the spanker-boom.

Lazy-painter. A small rope used for securing a boat in smooth water.

Lead. An apparatus used on board vessels to determine the depth of water. It is generally made of lead, of prismatic shape, tapering to the upper end, through which a hole is made for a strap, to which is attached a marked line. The lead is thrown overboard from the vessel, and when it reaches the bottom, and the line is vertical, the depths are shown by the marks on the line.

There are three classes of leads in use,—the hand-lead, weighing from 7 to 14 pounds, and from 6 to 10 inches in length; the coasting-lead, weighing from 25 to 50 pounds, and about 18 inches long; and the deep-sea-lead (pronounced *dipsey-lead*), weighing from 75 to 120 pounds, and about 2 feet long. The line used with the hand-lead is about 30 fathoms long, and is used in depths of 25 fathoms and under, that of the coasting-lead 120 fathoms long, and used in water from 25 to 100 fathoms in depth, and of the deep-sea-lead 300 fathoms, and used in depths over 100 fathoms.

These lines are marked,—hand-lead, at 1 fathom from the lead, generally, a toggle is placed for the leadsman to handle it by, at 2 fathoms 2 strips of leather, at 3 fathoms 3 strips, at 5 fathoms a white rag, at 7 fathoms a red rag, at 10 fathoms a piece of leather with a hole in it, at 13 fathoms the same as at 3, at 15 fathoms the same as at 5, at 17 fathoms the same as at 7, at 20 fathoms a piece of leather with two holes in it, or a piece of line with 2 knots, at 25 fathoms one knot, at 30 fathoms 3 knots.

The coasting- and deep-sea-lead-lines are both usually marked in the same manner, viz.: at 10 fathoms one knot, at 20 fathoms 2 knots, at 30 fathoms 3 knots, etc., and each 5 fathoms is marked by a piece of line with no knot, at 100 fathoms a piece of red bunting, at 200 fathoms a piece of white, and at 300 fathoms a piece of blue.

Heaving or casting the lead. To ascertain the depth of water by the use of the leads and their lines.

By the hand-lead.—The leadsman takes his place generally in the main chains of the vessel, or any place outside where he can have a good foothold and a clear swing, with a broad belt passing around his waist fastened at both ends, to prevent him from falling overboard. From his waist down he is protected from the drippings of the line by a tarpaulin. The end of the lead-line is fastened near by. He takes a coil of line in his hand sufficient, as he estimates, to reach the bottom, holding it clear for running out, and in the other hand the line at the toggle, swings the lead to and fro until it has sufficient velocity to carry the line out, when he lets it go in the direction in which the vessel is moving, letting the lead take the line from the hand having the coil, as the ship advances, so that when the ship arrives at where the lead reached the water the line is up and down, when he can feel if the lead has touched bottom. If the lead reaches bottom, he notes the mark at the water's surface, or estimates the depth from the nearest mark.

There are several nautical terms used by leadsmen in reporting soundings. They are reported in fathoms and quarters. All the depths marked on the line are called *marks*, and the fathoms not marked, "*deeps.*" For example, if the depth were 3 fathoms, it would be reported as "*by the mark 3*"; if 4 fathoms, as "*by the deep 4*"; if 3¼ fathoms, as "*and a quarter 3*"; if 3½ fathoms, as "*and a half 3*"; if 3¾ fathoms, as "*and a quarter less 4.*" If no bottom is reached, it is reported as "*no bottom*" at so many fathoms, the length of line thrown out.

When a vessel is going at a greater rate of speed than 8 knots, it is very difficult to get soundings in this manner in depths greater than 10 fathoms, and then the lead must be whirled around the head to make it carry out enough line.

A hand-lead as small as from 3 to 5 pounds weight, with a very light line marked to feet, is used from boats for running lines of soundings in shoal water.

By the coasting- and deep-sea-leads.—As it is important to know the character of the bottom, these leads have the lower end cup-shaped, and the hollow filled with soft clean tallow before being cast (called arming the lead). If the lead reach bottom, it is known by a sample sticking to the tallow; usually there is enough to indicate roughly the nature of the ground.

To get a sounding or *cast* with these leads, it is necessary to reduce the speed of the vessel, and if the water is deep, to stop her way altogether, and keep her in as near the same position as possible, which is done by "*luffing up,*" or "*heaving to,*" in a sailing-vessel, or by stopping and backing the engines in a steamer.

The lead is *armed* and taken to the bows of the vessel, a sufficient number of the crew stationed outside along the weather side of the ship. The line, either wound up on a reel or coiled down in a tub, is placed at the stern, the end rove through a snatch-block made fast outside the vessel at the stern in a convenient place, carried forward outside of everything and made fast to the lead. Each man stationed on the outside takes a coil of the line in his hand and keeps it clear for running until sufficient is judged to be out to reach bottom. When the vessel's way has been sufficiently checked, or she has been brought to a stationary position, the order is given, "*Stand by!*" "*Heave!*" When the lead is thrown overboard, the person doing it cries out, "Watch-oh-watch!" As the lead sinks each man lets it take the line from his hand, so that he can feel if it has reached bottom; if so, he cries out, "Bottom!" when the mark is noted and the line hauled in through the block aft. If no bottom is felt as the last part of the line leaves the man's hand, he calls out to his next aft, "Watch-oh-watch!" and so on to the stern, where the rest of the line may be left to run off the reel or out of the tub, watching to see if the lead touch bottom, which will be known by the line slacking. If the *cast* is satisfactory, the line is hauled in, the depth and character of the bottom noted, and the vessel resumes her way.

If the ship is in heavy weather, or drifting to leeward, it is best to take the line outside around the stern from to "windward," so that by the time it has run out it will be nearly up and down, the ship having drifted to that place while the line was running out. Sometimes a buoy and nipper is used to insure an up-and-down cast (called Burt's buoy and nipper). The line is run through a spring catch on the buoy, and the buoy thrown overboard with the lead and line; the line will run through the nipper as long as the weight of the lead is felt, but when it reaches the bottom the spring of the nipper will catch the line and hold fast, so that the depth may be measured on the line from the buoy.

The above methods are used to obtain soundings by vessels approaching an unknown coast, and so as to enable the navigator to tell from the depth and character of the soundings his approximate position in foggy weather on a coast of which there are good charts.

For soundings to be plotted on surveys and for scientific purposes finer work is needed, especially in deep-sea soundings.

Moderate soundings may be accurately determined by the hand-lead, as before described, moderating the speed of the vessel for the purpose.

A lead coming very much into use of late years is Thompson's pressure-lead, which consists of a glass tube fitted into the lead, so as to give free access to the water at its lower end.

This tube has a chemical preparation on the inside, which the water discolors as it forces its way up in the interior, which it will do in proportion to the depth the lead descends, and from the known laws of hydrostatics we can determine from the length of the discolored part of the tube the depth the lead has reached.—*J. E. Noël, Lieutenant-Commander U.S.N.*

LEAD-LINE. The line to which the lead is attached, and by which the depth of water is measured.

LEADSMAN. A man stationed to heave the lead.

Lead. The distance the main steam-valve has opened the port, when the piston is at the end of the stroke, or the crank is on the centre; if referred to the steam-port it is called *steam-lead*, if to the exhaust-port, *exhaust-lead.* When two engines are connected to one shaft, as in marine engines, the cranks are usually placed at right angles to each other, but sometimes this angle exceeds 90°, and one crank placed as much as 115° ahead of the other; this angular advance above 90° is termed the *lead of the crank.* A navigable channel through field-ice. The course of a rope from end to end; a rope *leads clear* when it passes directly from one block to another, or to the deck, without obstruction.

LEADER, or FAIR-LEADER. A piece of wood (usually lignum-vitæ) through which holes are bored, used for the purpose of leading ropes in their proper places.

LEADING-BLOCK. A block, secured to the deck, through which a rope is led for the purpose of convenience in pulling.

LEADING-MARKS. Elevated objects on shore, which, when in range, serve as a guide in entering port.

LEADING-PART. That part of the fall of a tackle which is led out and hauled upon.

LEADING-STRINGS (*Eng.*). Yoke-ropes, used in steering a boat in place of a tiller.

LEADING WIND. A wind abeam or quartering.

League. A measure of distance, more commonly used at sea, but in use by some European nations as a measure of distance on land. Among different nations the length of a sea league varies, as follows: United States, Great Britain, France, and Italy, 6075 yards; Holland and Germany, 8100 yards; Spain, 7416 yards; Russia, 8468 yards, etc. The *marine league* is the distance from the coast over which a government has jurisdiction, and this distance has been chosen as being the limit of effective range of artillery.

Leaguer (*Eng.*). A long water-cask used before the introduction of water-tanks. Its capacity was 159 imperial gallons.

Leak. A hole through which the water finds entrance into a vessel. *To spring a leak* is to strain the seams sufficiently to cause leakage.

LEAKAGE. The loss from a cask by leaking. The allowance which is made for the waste and leaking from casks of wines, liquors, etc., when duties are imposed.

LEAKIES (*Scotch*). Irregularities in the changes of the tide in the Frith of Forth.

LEAKY. The condition of a vessel which admits water through the seams, or that of a cask which will not retain liquid.

Lean. Thin or sharp, like the bow of a clipper.

Leaper (*Eng.*). A sea that breaks on board. Also, the spray from the waves under the bow.

Leap-year. See BISSEXTILE.

Leather. See LATHER.

LEATHER-JACKET. A fish found in the tropics, and so called from the thickness of its skin.

Leave, or Leave of Absence. Permission to be absent from a ship or station. A person takes *French leave* when he absents himself without permission, and breaks his leave or liberty when he does not return at the time specified.

Le Clanché Battery. See GALVANIC BATTERY.

Ledge. A line of rocks below the surface of the water. A short piece of timber in the deck-frame of a vessel, which is placed between the beams and let into the carline and knee.

Ledo. An old Latin law-term for the flow of the tide.

Lee, Samuel Phillips, Rear-Admiral U.S.N. Born in Virginia, February 13, 1812. Appointed midshipman from his native State, November 22, 1825; attached to frigate "Java," Mediterranean Squadron, 1828–32.

Promoted to passed midshipman, June 10, 1833; frigate "Brandywine," Pacific Squadron, 1834–35, and to sloop "Vincennes," same squadron, 1836–37.

Commissioned as lieutenant, February 9, 1837; attached to West India Squadron, 1839–42; coast survey, 1841–44; Pensacola Navy-Yard, 1845–46; coast survey, 1847–51; commanding brig "Dolphin," special service, 1852; hydrographical duty, 1852–54; Naval Observatory, Washington, 1855.

Commissioned as commander, September 14, 1855; special service, 1856–60. In 1861, Commander Lee was ordered to command the sloop-of-war "Oneida," and in that vessel took part in the attack and passage of Forts Jackson and St. Philip, and the various battles on the Mississippi from New Orleans to Vicksburg, winning a high reputation for gallantry and devotion to duty.

Commissioned as captain, July 16, 1862, and ordered to the command of the North Atlantic Blockading Squadron, with the rank of acting rear-admiral. While in command of the North Atlantic Blockading Squadron, he greatly harassed the enemy by numerous expeditions up the navigable streams within the limits of his squadron. He was at all times ready to co-operate with the army, and on more than one occasion the presence of his vessels saved the military forces from serious disaster. Wilmington, N. C., was the most difficult port on the coast to blockade, but Acting Rear-Admiral Lee, by a wise distribution of the vessels of his squadron, made the blockade as effective as it was possible to make it. In the summer of 1864, he was transferred to the command of the Mississippi Squadron. In December of the same year he rendered good service to the country, by keeping open the Cumberland River at the time Hood's army was advancing on Nashville, and when the safety of the army under Gen. Thomas depended in a great measure upon reinforcements and supplies reaching them promptly; the railroad communication between Louisville and Nashville having been interrupted, the Cumberland River was the only channel of communication. During this campaign he was several times under fire, and for his services received a vote of thanks from Congress. In 1865 the

Mississippi Squadron was disbanded and most of the vessels were sold, Captain Lee being ordered East.

Commissioned as commodore, July 25, 1866; in 1866–67, he was president of the board to examine volunteer officers for admission into the regular navy; on special duty at Washington, D. C., 1868–70.

Commissioned as rear-admiral, June, 1870, and to the command of the North Atlantic Fleet. Retired, 1873.

Lee. The direction towards which the wind blows, used in contradistinction to *weather*, or the direction from whence it comes. Hence the lee side of a vessel is the side opposite to that against which the wind blows. The word is also used in the sense of shelter; as, "The ship is under the lee of the land," or protected by the land. A ship is *brought by the lee* when her course is changed so as to cause the wind to blow against what was before the lee side, thus laying the sails aback.

LEE-ANCHOR. The anchor on the lee-bow when the vessel is under way. When moored, the lee-anchor is the one to which the vessel is not riding.

LEE-BEAM. The position of an object on the lee side of a vessel when a line drawn from the object to the vessel would be at right angles to the keel.

LEE-BOARD. A board or frame fastened to the side of a small vessel, to serve as a keel and lessen the amount of leeway when close-hauled.

LEE-FANG (*Eng.*). A rope passed through the sheet-cringle of a jib, for hauling it amidships while the bonnet is being laced.

LEE-FANGE (*Eng.*). The iron bar or traveler secured to the deck in small fore-and-aft vessels upon which the sheets slide.

LEE-GAUGE. The position of a vessel when to leeward of another. See WEATHER-GAUGE.

LEE-GUNWALE UNDER. Said of a boat when carrying such a press of sail that the lee-gunwale is at the water's edge.

LEE-HATCH. A former order to the helmsman not to steer to leeward of the course was, "Take care of the *lee-hatch.*"

LEE-LURCH. A heavy, sudden roll to leeward.

LEE-SHORE. A coast against which the wind is blowing.

LEE-SIDE. The side of a ship which is farthest from the wind. Junior officers of the watch, and officers not on duty, are allowed to promenade on the lee side of the quarter-deck.

LEE-TIDE. A tide which runs in the direction of the wind.

LEEWARD. Towards the lee,—used in a general sense.

LEEWARDLY. Said of a vessel which sags to leeward when close-hauled, showing a lack of weatherly qualities.

LEEWAY. The drift which a vessel makes when close-hauled. The amount is greater or less according to the weatherly qualities of the vessel, the force of the wind and sea, and the amount of sail which the vessel can carry.

LEE-WHEEL. The lee side of the wheel, where the assistant to the helmsman is stationed.

Leech. The side of a square-sail, and the after edge of a fore-and-aft sail.

LEECH-LINE. A rope with which the leech of a course is pulled up to the yard.

LEECH-LINE BLOCK. A block fastened to the fore- or main-yard, through which the leech-line is rove.

LEECH-ROPE. The rope which is sewed to the leeches. See SAILS.

Left-handed Rope. Rope laid up against the sun.

Leg. The course and distance made upon one tack. A *good leg* is made when the course on a tack is near the desired course. *Long* and *short* legs refer to the comparative distances sailed upon different tacks. The spars of which a pair of sheers are formed are called *sheer-legs*. The ends of two ropes spliced together, as bunt-lines are sometimes made, are also called *legs*. A ship is said to have *legs* when she is a fast sailer.

LEG-ALONG (*Eng.*). To lead out a rope ready to be manned.

LEG-BAIL. To give *leg-bail* is to escape from custody.

LEGS OF THE MARTINETS. Two ropes, fastened to the leech-rope of a course and spliced together, to which the martinet was secured.

LEGS AND WINGS. Said of a vessel with masts of great height, and which consequently has too great spread of sail.

Legger. A mis-pronunciation of *leaguer* (which see).

Leghorn, Italy, one of the best known of the Mediterranean ports, is situated on a tongue of land extending into the Mediterranean, in lat. 43° 32′ 42″ N., lon. 10° 27′ 45″ E. The exports consist chiefly of manufactured articles of coral, woolen, and silk goods, straw bonnets, cordage, leather, etc. The harbor is of large extent, but is somewhat difficult of entrance. The roadstead W.N.W. of the harbor is protected by a long sand-bank, and has good anchorage. Originally a Roman port, it had dwindled to a fishing-village, when its fine capabilities for commerce were discerned by the celebrated Medici family, who constructed its harbor and surrounded it with fortifications, and bestowed upon it the privilege of full toleration for all nations and creeds. Pop. 98,000.

Leister (*Eng.*). A spear with three prongs used for taking fish.

Leit (*Eng.*). A fishing-line made of horsehair.

Leith, Scotland, is the seaport of Edinburgh, from which it is distant 2 miles, on the south shore of the Frith of Forth. Lat. 55° 58′ 54″ N.; lon. 3° 10′ 30″ W. The chief manufactures consist of ropes, cordage, sails, chemicals, glassware, etc. It has extensive ship-building yards, sugar-refineries, and breweries. The harbor is an excellent one, and is protected by two piers or breakwaters, which advance from opposite shores toward each other, making the entrance but 250 feet in width. There are extensive wet-docks, graving-docks, dry-docks, and the harbor is also protected by a battery. Pop. 45,000.

Leith (*Swe.*). A channel.

Lembus. An ancient name for a small piratical craft having no deck.

Leming-star. The name formerly given to a comet.

Lemon Rob (*Eng.*). Lemon-juice thickened by evaporation.

Lend a Hand. To give assistance.

Lend Your Pound. To assist by one's weight,

as in hauling upon a rope. It refers to the allowance of meat in the navy ration.

Lengthening. In a ship, is adding to the length. It is sometimes performed on the ends of a ship, and nowadays 100 feet is often put into the middle of the long steamships. It is done by driving out all of the fastenings in the wake of the butts which secure the ship amidships; the ends are then drawn apart to the distance required, the keel is then made good, and new floors, frames, and keelsons put in, as was practiced when commencing the ship, and a new ship practically built in the space which has been made by the separation of the two ends. Great care and good judgment are required in connecting the work again, and proper arrangements made to retain the strength which is lost to the structure by the addition of this central piece.

Length of a Wave. The horizontal distance between two adjacent crests, or two adjacent hollows.

Lens. A glass used in magnifying instruments.

Lentria. An ancient name of a small vessel used in river navigation.

Lenunculus. An ancient fishing-boat.

Leo, Constellation of (*Lat.* "The Lion"). The fifth constellation of the zodiac, coming between Cancer and Virgo, and situated near the Great Bear on the opposite side of it to the pole star. Its four principal stars form a trapezium. α *Leonis*, called also *Cor Leonis* ("The Lion's Heart") and *Regulus*, may be found by joining α and β Ursæ Majoris ("The Pointers") and continuing the line about twice the length of that constellation; this line also passes γ *Leonis*. β *Leonis*, called also *Denebola* ("The Lion's Tail"), is found by joining η Ursæ Majoris (the last star in the tail of the Great Bear) with Cor Caroli, and continuing it to about twice its length.

Leo, Sign of. The fifth sign of the ecliptic, including from 120° to 150° of longitude. Owing to the precession of the equinoxes, the constellation Cancer, and not Leo, is at present in this sign. The sun is in Leo from 22d July to 23d August. Symbol ♌.

Leo Minor. See CONSTELLATION.

Lepadogaster. A genus of fishes having the ventral fins expanded and curved forward, so as to form the boundary of an adhesive disk beneath the throat, and the body smooth and without scales.

Lepidosiren. A very remarkable genus of animals, by some regarded as a fish, and by others as a batrachian. The bones are very soft and cartilaginous, or even gelatinous, except those of the head, which resemble those of no other known vertebrate, though most like fishes. The scales are cycloid. The dentition is very remarkable. The jaws are covered with an undulating ribbon of bone, covered with enamel, the undulations of the upper and lower jaw adapted to each other, and along the edges are small, sharp teeth. There are free filamentary gills situated under gill-covers, as in osseous fishes, but two of the arterial arches, which ordinarily supply the gills of fishes with blood, are represented by trunks, which proceed to the double air-bladder, and ramify over its cellular surface, so that the air-bladder, having a communication with the mouth, is capable of serving to a certain extent the purpose of lungs, and the animal is enabled to sustain a torpid existence during the dry season in mud, in which it forms for itself a kind of nest, which has been likened to the cocoon of an insect, by means of a mucous secretion from its body. It is found in ponds and rivers of intertropical Africa and South America.

Leppo. A composition used by the Chinese for paying the seams of a vessel.

Lepus. α *Leporis*, Arneb. See CONSTELLATION.

Le Roy, William E., Rear-Admiral U.S.N. Born in New York, March 24, 1818. Appointed from New York, January 11, 1832; attached to frigate "Delaware," Mediterranean Squadron, 1833–36; brig "Dolphin," Brazil Squadron, 1837–38.

Promoted to passed midshipman, June 23, 1838; frigate "Constitution," Pacific Squadron, 1839–40; store-ship "Erie," 1842–43.

Commissioned as lieutenant, July 13, 1843; steamer "Mississippi," Home Squadron, 1846; steamer "Princeton," Home Squadron, 1847; engagement with Mexican soldiers at Rio Aribiqua, while assisting to water the "Princeton"; sloop "Savannah," Pacific Squadron, 1849–51; waiting orders, 1852; frigate "Savannah," Brazil Squadron, 1853–55; Naval Station, Sackett's Harbor, New York, 1857–58; frigate "Sabine," Brazil Squadron, 1859; commanding steamer "Mystic," coast of Africa, 1861.

Commissioned as commander, July 1, 1861; commanding steamer "Keystone State," South Atlantic Blockading Squadron, 1862–63; capture of Fernandina, 1862; engagement with ironclads, off Charleston, S. C., January, 1863; commanding steam-sloop "Oneida," Western Gulf Squadron, 1864; commanding steam-sloop "Ossipee," Western Gulf Squadron, 1864–65. Commanded the "Ossipee" at the battle of Mobile Bay, August 5, 1864; his vessel was struck many times, but, fortunately, not disabled. When about running down the "Tennessee," that vessel displayed a white flag, and Capt. Le Roy received her surrender from Capt. Johnson, her commander, the rebel admiral, Buchanan, being wounded; naval rendezvous, New York, 1866–67.

Commissioned as captain, July 25, 1866; fleet-captain, European Squadron, under Admiral Farragut, 1867–68.

Commissioned as commodore, July, 1870; special duty, New London, 1871; senior officer Board of Examiners, 1872–73.

Commissioned as rear-admiral, April 5, 1874; commanding South Atlantic Station, 1874–76; North Atlantic Station, 1876; European Station, 1878–80. Retired March 24, 1880.

Lerrick (*Eng.*). The sand-piper.

Lesseps, Ferdinand de. A French engineer, rich in original conception and skillful in execution. Through his untiring efforts the channel connecting the Mediterranean with the Red Sea, and now known as the Suez Canal, was opened, to the infinite advantage of the trade between Europe and India. He has recently conceived a plan for establishing a communication between the Atlantic and Pacific, across the Isthmus of Panama.

Lesser Circle. A circle whose plane does not pass through the centre of the sphere.

Let Draw. The order given in tacking a fore-and-aft vessel, at which the sheets of the jibs are allowed to slip to the lee side, after the vessel's head has fallen off sufficiently from the wind.

Let Drive. To throw.

Let Fall. The order to let a sail drop from the yard after loosing.

Let Fly. To let a rope go quickly without first slacking away.

Let Go and Haul. An order in tacking, when the fore-bowline and lee head-braces are let go and the head-yards are hauled around.

Let Go Under Foot. Said of an anchor when it is let go, but, the vessel being stationary, without veering cable.

Let In. To secure one timber to another, as a carline to a beam, by a mortise and tenon.

Let Out a Reef. To increase the size of a sail by untying one line of reef-points.

Let-pass (*Eng.*). A pass or paper furnished to a vessel to prevent detention by a ship of war.

Let Run, or Let Go by the Run. To let go quickly.

Letter-board. See NAME-BOARD.

Letter-book. A book for the preservation of copies of letters.

Letter-man (*Eng.*). See KING'S LETTER-MAN.

Letter of Marque. A commission or license issued by a government to a private armed vessel authorizing reprisals on an enemy. The first commissions of this kind were issued about the middle of the 13th century, during the reign of Edward I. of England, and vessels carrying such commissions, called also "letters of marque," have taken a prominent part in succeeding wars between maritime nations as late as the early part of the present century.

Letter of Reprisal. See LETTER OF MARQUE.

Lettuce-laver (*Eng.*). The *Ulva lactuca*, an edible kind of sea-weed.

Leuciscus. A genus of fishes including the dace, chub, minnow, and the like.

Levant (*Fr.*). The east, or place of sunrise. The term is applied to those countries which are washed by the eastern part of the Mediterranean Sea. Also a cant-term used in England, meaning to run away without paying one's debts.

LEVANTER. A strong easterly gale frequently encountered in the Mediterranean.

Levantis. The crew of a Turkish galley.

Levee (*Fr. lever*, to raise). An artificial embankment on the banks of a river.

Level-error. The error of the transit instrument when the axis deviates from a horizontal plane.

Leveling. The art of ascertaining the difference in the heights of objects or places on the earth's surface.

Level Out. To continue a horizontal line from a given point.

Level of the Sea. The zero plane from which heights and depths are reckoned. As the actual sea-level is constantly varying with the tides, it is necessary to define more particularly the standard for comparison. The *mean* level of the sea is the middle plane between the levels of high and low water. Though the range of the tide may vary considerably, this mean level fluctuates within very narrow limits.

Level-lines. The horizontal lines which determine the shape of the body of a vessel.

Level, Spirit-. An instrument for ascertaining the horizontality of a line or plane. It consists of a hollow glass tube of uniform bore closed at both ends, and nearly filled with a fluid of great mobility, such as spirit of wine or sulphuric ether, an air-bubble remaining inclosed. The tube is not quite straight, but has a slight uniform curvature, the convex side being placed upwards. The air-bubble will always occupy the highest position, and this will be the middle point of the tube when the instrument stands in a perfectly horizontal position as regards its length. To ascertain the horizontality of a given line, the level is first placed upon it, and the position of the bubble noted; it is then reversed end for end, and the bubble must remain in the same position as before. For a plane the test must be repeated in a direction perpendicular to the first pair of observations. Astronomical levels are furnished with a divided scale by which the position of the ends of the bubble can be accurately noted.

Lever-engine. A modification of the side-beam (or *lever*) engine, in which the beams are levers of the second order, the fulcrum being at one extremity of the lever and the piston-rod connection at the other, the connecting-rod to the crank-pin being joined to the beam at some point between the two.

Levet (*Fr. lever*, to raise). A blast or call with the trumpet, corresponding, probably, with the reveille of the present day.

Levin (*Anglo-Saxon*). A word for lightning, now obsolete.

Levis. An ancient name for a small open boat.

Levy, Uriah P., Commodore U.S.N. Born in Pennsylvania; died in New York City, March 22, 1862. He entered the navy, March 29, 1812; was an officer of the brig "Argus," which escaped the blockade, took out Mr. Crawford, minister to France, and destroyed in the British Channel 21 sail, one of which had a cargo worth $625,000. On the capture of the "Argus" he was made prisoner, and held two years. Lieutenant, March 5, 1817; commander, February 9, 1837; captain, March 29, 1844. His last cruise was in 1858, as flag-officer of the Mediterranean Squadron. Commodore Levy was the mover of the effort to abolish flogging in the navy. He published a "Manual of Rules and Regulations for Ships of War." An ardent admirer of Jefferson, he became the owner of Monticello, the valuable estate once owned by that statesman, which, with all its stock, dwellings, pictures, etc., was confiscated by the Confederates in consequence of his devotion to the "old flag."

Levy. To conscript.

Lewer (*Eng.*). A corruption of *lever;* a handspike.

Lewis-hole. Formerly, a hole in the surface of a mortar for the admission of the *lewis*, an iron clamp which served as a handle.

Lewth (*Eng.*). From Anglo-Saxon *lywd.* A place of protection from the wind.

Libera Piscaria. A term in law, meaning free fishery.

Liberty. Permission given to a part of a ship's crew to go on shore for a stated number

of hours. *To break one's liberty*, to remain absent beyond the time authorized.

LIBERTY-DAY. A day upon which the crew are to have liberty.

LIBERTY LIQUOR (*Eng.*). Liquor that was formerly allowed to be sold to a sailor on board ship for the purpose of entertaining a visitor.

LIBERTY-MAN. One of the crew who has been granted liberty.

LIBERTY-TICKET. A paper which is sometimes given to a liberty-man, upon which is specified the extent and date of his liberty.

Libra, Constellation of (*Lat.* "The Balance"). The seventh constellation of the zodiac, coming between Virgo and Scorpio. It contains two principal stars, α^2 *Libræ*, the *North Balance*, and β *Libræ*, the *South Balance*, the former bisecting the line joining Spica and Antares, the latter with Spica and Arcturus forming a triangle.

LIBRA, FIRST POINT OF. The *autumnal equinoctial point*, one of the points where the ecliptic crosses the equinoctial, is so called because it is the commencement of the sign Libra.

LIBRA, SIGN OF. The seventh sign of the ecliptic, including from 180° to 210° of longitude. Owing to the precession of the equinoxes, the constellation Virgo, and not Libra, is at present in the sign. The sun is in Libra from September 22 to October 23. Symbol ♎.

Libration. In general, the moon always presents the same face to the earth, but she passes in her complex movements through certain changes of position which resemble oscillations or vibrations, and in consequence of these vibrations small portions of the opposite face of the moon are seen. These changes are called *librations*. There are three, libration in longitude, libration in latitude, and diurnal libration.

Liburna. An ancient galley used by the Liburni, or Adriatic pirates. It was propelled both by sails and oars.

License. The certificate given by a board of trade to a master or mate of a merchant vessel, showing him to be qualified for the position.

Lick. A slang term for flog or thresh. Also, to excel another. Work imperfectly done is said to have received "a lick and a promise," and an experienced seaman may be said to have received "a lick of the tar-brush."

Licorn. A short howitzer, used during the last century.

Lie a Hull. To lie with no sail set.

Lie Along. To careen with a beam wind. *To lie along the shore* is to coast, keeping the land in sight.

Lie Athwart. To lie across, as a vessel when lying to the wind across, or at right angles to the tide.

Lie By. To arrange the sails in such a manner that the effect of the wind upon one part will counteract its effect upon the rest, and check the vessel's headway.

Lie In. See LAY.

Lie Off. To remain at a distance.

Lie Out. See LAY.

Lie Over. To heel or careen with the wind.

Lie To. To head a ship as near the wind as possible during a gale, in order that she may be in the position of greatest safety. The helm is kept a-lee and sail set, which will steady the vessel and keep the head to the wind. The main topsail, close-reefed, main trysail, and fore storm-stay-sail are usually required for a full-rigged ship, but some ships lie to more easily with a different arrangement of sails.

Lieutenant. An officer of the navy holding equal rank with a captain in the army. Their duties on shipboard are those of watch-officers and navigators, or executive-officers of the smaller classes of vessels, and they take rank according to the dates of their commissions. See NAVIGATOR, WATCH-OFFICER.

Lieutenant-Commander. The grade in the navy next below that of commander, and holding equal rank with a major in the army. An officer of that grade is usually ordered as the executive-officer of the first-, second-, and third-rates, or in command of a fourth-rate vessel. See EXECUTIVE-OFFICER.

Lieutenant-at-arms (*Eng.*). Formerly, the junior lieutenant of a ship, who was detailed for drilling the crew with small-arms.

Life-belt. A belt of rubber, or one containing cork, to serve as a life-preserver.

Life-boats and Boat-detaching Apparatus. A life-boat is one especially built for use in storms, heavy seas, and broken water, where an ordinary boat could not venture without imminent risk of destruction. See LIFE-BOATS AND LIFE-RAFTS.

Life-boats in use on shipboard are usually boats calculated by their build to be particularly seaworthy. On men-of-war they are usually light cutters or the New Bedford whale-boat, than which, in proper hands, there is no better seaboat.

Being sharp at both ends and with great sheer of gunwale, they are well calculated for surf-boats, but must invariably be steered by an oar, and provided with a "drogue" when on such service.

The so-called metallic life-boat used so generally on passenger steamers is built by stamping out the sides of the boat from sheet-metal by hydraulic pressure, a corrugation resembling the seams of a lap-strake-built boat being given for stiffness. These sides are then fastened to a wooden keel, stem, and stern-post. An air-chamber is placed in each end, as without them, owing to the weight of the metal of which they are built, they would at once sink if filled with water.

Some English-built ships' life-boats have extra buoyancy given them by cylindrical air-tanks under the thwarts, like those just abolished from the American surf-boats.

In England, steam-cutters for ships' use have been made unsinkable by giving extra buoyancy with air-chambers in the bow and stern and along the sides.

When heavy ships' boats are to be sent into a surf or heavy sea, additional buoyancy may be given them temporarily by lashing small casks or water-breakers under the thwarts. They should be placed along the sides as much as possible to prevent the water from settling there if the boat is thrown on her beam-ends.

Richardson's tubular life-boat has been used to some extent in England as a surf-boat. It is made of two parallel tubes with the ends turned up and in, and carrying between them a framework to support the thwarts, masts, etc.

It is more a form of "balsa" or "catamaran" than a boat.

Detaching apparatuses are contrivances fitted

to ships' boats, and life-boats in particular, to readily free them from their "falls" or tackles at the will of the person in charge, or automatically when water-borne.

The inventions to accomplish this end are numberless, and in the patent records of the United States and Great Britain there are many hundreds. A commission was appointed by the English government about 1870 to look into this subject and select an apparatus for use in that country, but it was poorly advertised, and no definite action was ever taken.

The advantages gained by the use of a boat apparatus are the following: In the case of a man overboard or other emergency, the boat, with her crew in her, may be lowered nearly to the water and then dropped at the will of the operator without waiting to deaden the ship's headway, as would be necessary under ordinary circumstances. In heavy weather, with the vessel rolling and pitching, a favorable opportunity may be seized and the boat instantly freed and pushed clear. In case of fire or shipwreck, when it is necessary to abandon the ship, the boats may be lowered with all on board, except those stationed to lower, to a safe distance; those remaining on board can then come down the falls while they are yet taut and the boat clear of the water, and consequently in no danger of being capsized or swept away, and then at the proper moment she can be detached.

The oldest detaching arrangement in existence has been used for many years by the American whalers in the constant and dangerous boat-lowering they do. It is simply a rope-runner at each end of the boat by which she is lowered into the water, and they are allowed to unreeve as the boat is swept away. This, though very simple, has the disadvantage of requiring a second set of falls to hoist by. The runners must also be tended by two skilled men on the vessel, who must act in unison to place the boat in the water at the proper moment. A kink in the rope in unreeving is also apt to capsize the boat unless quickly cut.

The first regular apparatus intended to obviate some of these defects came into use in the U. S. navy about 1859, and was the invention of Hunter Davidson, then a lieutenant in the navy. His apparatus also lowered and detached by one set of falls and hoisted by another, but it was detached in the boat itself at the will of the person in charge. There was no chance of a foul after it was once started, and one man lowered both ends of the boat at once.

The objections to this and most of the many others that have followed it in this and all other maritime countries have been, that they were complex, easy to get out of order, hard for the ordinary sailor to understand and manage, and in many cases cumbersome, taking up the best part of the boat.

A good boat apparatus should be very simple, easily understood and managed by the dullest coxswain, not liable to accidentally detach the boat, or detach her when lifted by a sea, either at the davit-heads or while lowering, as in the latter case especially only one end might be freed and the boat surely swamped. It should not encumber the boat in any way, and especially should it not be in the way of the crew. It should provide a simple, easy method of hooking on when the boat returns; for this is one of the most difficult parts of the operation of handling a ship's boat in heavy weather, and is a point which the inventors of boat apparatuses have almost universally neglected, thinking it quite sufficient to get their boats clear of the ship, and not realizing that it is quite as important at most times to get her back again readily.

An apparatus is found especially convenient in a stern boat, as it is sometimes very difficult to unhook the ordinary falls in a tide-way, as the boat is swept astern as soon as she touches the water. Boat-detachers have, like all other innovations, had opponents among professional men, but the necessity for a good contrivance of this kind is now generally acknowledged by all who understand the subject and are not influenced by mistaken economy to object to the outlay necessary to so provide their boats.

The writer has knowledge of several lives saved which would have been lost but for the time gained and facilities given by a "detacher," and no one can deny that the long death lists from steamboat disasters, now filling the papers in this month of June, 1880, might have been smaller if these vessels' boats had been properly provided in this and other respects. Ships' life-boats should always be ready to lower at a moment's notice, but it too often happens that what might be gained by an apparatus is more than lost by reversed davits, foul falls, lashings, boat-covers, etc., and such will continue to be the case, in passenger vessels at least, until public sentiment forces a law covering these points, and then sees it carried out.—*W. M. Wood, Lieutenant U.S.N.*

Life-boats and Life-rafts. For the best types of life-boats it is necessary to look to those nations whose citizens have given the most attention to saving lives from wrecked vessels. In 1784, Lionel Lukin designed an "unimmergible boat," and four years later Henry Greathead, a boat-builder, also of Great Britain, built a boat; the rudimentary points of these boats have been developed, and will be briefly described as they exist.

To the "Royal National Institution for the Preservation of Life from Shipwreck," founded in Great Britain in 1825, is due in a great degree establishments for the same object by other peoples as national institutions, usually adopting the life-boats, or the principles of their construction, to some extent.

The life-boats of Great Britain are of two types, one self-righting and self-bailing, the other very difficult to upset but not self-righting; both are insubmergible. The largest of the first named are 40 feet long, 10½ feet beam, and 5 feet deep amidships. They have metal keels of from 600 to 1500 pounds weight, and have the same weight in cork as of ballast, confined beneath a water-tight deck at the load-line. The boat is propelled by 12 oars, and her buoyancy, when swamped or capsized, is due to air-cases at the ends and along the inside of the boat, aided, even when stove, by the cork-ballast, and when not stove, the floor part of the boat acting as an air-chamber, being covered by a water-tight deck before mentioned. The sheer of the boat is considerable; the elevated end air-chambers, aided by the weight of keel and ballast, cause her to right if upset. Should a sea fall on

board it would fill up the space above the water-tight deck at the load-line, and would at once discharge itself through valves. The weight of the boat causes a draft of 22 inches, and makes launching and landing difficult, but, on the other hand, gives great steadiness in a heavy sea. Sails are used at will. The usual weight is 4000 pounds; these boats are of the "diagonal build," usually of mahogany, but sometimes of fir-wood. The means of transportation along a beach is a wagon of 2000 pounds weight, drawn by horses.

The other type of life-boat is from 36 to 40 feet in length, and from 10½ to 12 feet beam; sails are employed, and the boat is heavily water-ballasted, on the general principle of being "water-logged," and, when filled, making the water incapable of shifting; this also as the first-named type has an iron keel of about the same weight. Of the 270 life-boats of the British Institution, 21 have not the principles of construction which make them self-righting.

The "surf-boat" usually employed on the eastern coast of the United States in the Life-Saving Service, is, as the life-boat, insubmergible, but not self-righting and bailing, and though inferior in strength, has the advantage in lightness for passing through surf. It is surrounded by a cork fender, is fitted with life-lines for persons in the water, and is easily managed under the lee of a wreck from its lightness. The boat is propelled by oars and requires a crew of 7 men.

Several of our harbors on the Northern lakes are furnished with English life-boats, there being facilities for lowering or launching them. In general, from the shoal character of the water on the Atlantic coast of the United States, the surf-boat has been found well adapted and more useful than the English life-boat would be. A modification of the last named, self-righting and self-bailing, but of much less weight and draft, is now introduced at some points on the Atlantic coast where bold water and other facilities exist for launching.

For some years merchant steamers have been furnished with galvanized sheet-iron cylinders having conical ends, yoked in pairs at some space apart by a frame-work, having slats between them arranged in such manner that, if capsized, the oars attached can be used. The cylinders composing the raft are in several parts or water-tight sections, held together by a connecting rod.

Vessels of war of the United States are furnished with what is known as the "Ammen balsa," or raft. It is composed of two casks of wood with oval cross-sections, having a slight taper from the centre towards the ends. Five feet from the ends the staves of the floor and sides are so beveled as to make very small heads to the casks, and forming almost a straight back. The casks are yoked together at a space apart equal to the superior diameter of a cask, and slats are screwed from beneath between them so as to make a platform. The largest size issued to the navy has a length of 23 feet, and as yoked, 5 feet broad; weight, with oars, mast, and sail, 945 pounds, with a possible displacement or buoyancy of 5225 pounds. It pulls fairly, and when fitted with a centre-board will beat to windward in a heavy breeze and sea. The casks have scuttles fitted with thumb-screws, which permit them to be stowed with water, provisions, or other articles, and then made water-tight.

The "india-rubber balsa" has been in use since 1837. It is composed of two or more air-tight bags with apparatus for inflating them, and a frame-work of wood to keep them in position. It is comparatively light and portable.

"Balsas," or life-rafts, have been supposed defective as life-boats for use from the shore on account of the great difficulty, if not impossibility, of getting them off a beach through a heavy surf in the face of a gale. This difficulty could be obviated by planting disks of iron, with chains attached at such points as might be thought advisable.

Comparing the different life-rafts: the first named are heavy in comparison to their sustaining capacity, and have small power of locomotion by sail or oars; the second have a great capacity to sustain a load as compared with their weight, and can be made by any cooper or boat-builder, without royalty. If they should be capsized the sustaining power is not diminished, and they can be righted in the water by a number of persons acting together, or by few persons, if one of the casks is allowed to fill partially with water. They pull and sail fairly, and afford the facility of placing water and provisions within them. If made to sustain the dead-weight of 60 men, they need not weigh more than 1000 pounds. If injured, as the pressure is from without, a patch of lead, canvas, or wood will serve, or even a rag punched into the hole. Their applicability for passenger steamers and ships, from comparative small weight and cost, would seem obvious.

India-rubber "balsas" are liable to injury from heat and moisture, and become useless if torn or punctured, as they are very liable to be; the pressure being from within, the escape of air would destroy the buoyancy. They would be useless on a rocky shore, and are necessarily expensive.

The following may be deduced from the above: no life-boat is known which, under all circumstances of beach, facilities or difficulties of launching, etc., is unequivocally the best. For the use of vessels life-rafts may have the following advantages over boats: a greater sustaining power at less cost, and with less weight proportionate to their sustaining power; relative ease of getting them overboard in a sea-way without injury, and if the pressure is from without, very easily repaired when injured. Add to this the impossibility of swamping, and the ease with which the life-raft could be righted if capsized in launching, which would, under the same circumstance, render the boats ordinarily carried by ships entirely useless.—*Daniel Ammen, Rear-Admiral U.S.N.*

Life-buoy. A structure intended to save the life of a person who may have fallen into the water. That in general use in the navy consists of two metallic cylinders connected by a central spindle, to the upper end of which is fixed a port-fire. The frame-work at the lower end of the spindle serves as a resting-place for the feet. One life-buoy is attached to each quarter, and is let fall into the water by means of a knob, which being pulled, detaches the buoy from the ship. If required for use at night, another knob is first pulled, which ignites the port-fire by means of a hammer and percussion-cap. The burning of

the port-fire indicates the position of the buoy. A small red flag is attached to the spindle by day to assist in keeping the buoy in sight. Circular buoys are also used, which may be cut clear of a vessel's stern, or thrown to a person in the water.

Life-kite. A kite contrived for the purpose of sending a line from a wreck to the shore, as a means of escape from the vessel.

Life-line. A rope stretched about the deck during a gale, by which the men can save themselves from being washed overboard by heavy seas. A life-line is also extended from the lift to the mast above each yard-arm, and serves as a support to the men in manning yards.

Life-preservers. Devices for preserving the buoyancy of the human body, and for reaching the shore in cases of shipwreck or other casualty afloat. The favorite material of their construction is cork. It has been calculated that one pound of cork is amply sufficient to support a man of ordinary size and make. The cork life-preservers have generally the form of a jacket or a belt, and a great variety of them have been patented. A life-buoy held in high esteem among sailors is composed of slices of cork, neatly and compactly arranged so as to form a buoyant zone of about 30 or 32 inches in diameter, 6 in width, and 4 in thickness. It contains about 12 pounds of cork, and is generally covered with painted canvas to add to its strength and protect it from the injurious action of water. A buoy so constructed can sustain six persons, and it is generally furnished with a life-line (a cord running round the outside of the buoy and fastened to it at four points) to afford a more convenient hold. A few years ago, on the invention of india-rubber cloth, inflated belts of this material were made, and found to be superior in buoyancy to the cork belt, besides, when emptied of air, being very portable. They are, however, much more liable to damage by being punctured or torn, or to decay by being put away while damp. Some of these defects are remedied by having the interior of the belt divided into several compartments, so that when one is damaged the remainder may suffice. Their susceptibility to damage, however, by want of care and the effects of climate militates strongly against their general use. Mattresses stuffed with cork have been extensively used, and are highly effective as life-preservers. Faced with one-inch thickness of horse-hair, they are very comfortable for ordinary purposes, and are preferred by many to those made wholly of hair. The buoyancy of the cork mattress may be increased by means of a water-proof sheet, which, placed within a hammock, enfolds the mattress and bedding. Mr. R. B. Forbes, of Boston, who has devoted much time and attention to the subject of life-saving appliances, has shown by experiment that a common hammock and a hair mattress put into a water-tight bag securely tied at its mouth would float indefinitely with two 32-pound shot attached to it. The chairs, benches, stools, seats, cushions, and many other articles of equipment about ships may be made valuable as life-preservers by being rendered air-tight or fitted with air-tight attachments. See Life-boats and Rafts.

Life-saving Service of the United States. This admirable and beneficent institution was organized by act of Congress, approved June 18, 1878. Its purpose is sufficiently indicated by its title, and it is unique as being the only exclusively governmental establishment of the kind in the world. Previous to its organization the principal efforts in the direction of succoring shipwrecked voyagers along our coasts had grown out of the operation of the Massachusetts Humane Society, which, as early as 1789, had caused huts to be erected at some of the most desolate points on the coast of Massachusetts for the shelter of shipwrecked persons fortunate enough to reach the shore. The first life-boat station was established by this society at Cohasset in 1807, and subsequently others were added. The society received from time to time pecuniary aid from both the general and State governments, by which it was enabled to extend and improve its operations. Although relieved of a portion of its self-imposed task of benevolence by the organization of the governmental establishment, it still exists, and efficiently supplements the operations of the latter in alleviating the distress of shipwrecked mariners on the Massachusetts coast. Similar societies have at times existed in other parts of the country, but they have now, for the most part, either discontinued their organization, or diverted their operations into other channels. The first step toward a distinctively national life-saving service was the appropriation by Congress in 1848 of $10,000 for providing surf-boats and other appliances for rescuing life and property from shipwreck on the coast of New Jersey. Eight buildings were erected at different points on that coast, and were fitted with the necessary appointments. This was followed by an appropriation of $20,000 in 1849, with which 8 buildings were built and furnished on the coast of Long Island, and 6 added to those previously erected in New Jersey. In 1850 Congress made another appropriation of $20,000, half of which was expended in establishing additional stations on Long Island, and one at Watch Hill in Rhode Island, and the other half in placing life-boats and boat-houses at different points on the coasts of North and South Carolina, Georgia, Florida, and Texas. Appropriations amounting to $42,500 were made to the Life-saving Service in 1853–54, with which 14 new stations were added to those on the New Jersey coast, and 11 to those on the coast of Long Island. Twenty-three life-boats were distributed along the shores of Lake Michigan, and others were placed at different points on the Atlantic and Lake coasts. Exclusive of the boats at the 55 stations on the New York and New Jersey coasts, there were in 1854 82 life-boats at different localities elsewhere. The same year Congress passed an act, under the provisions of which a superintendent at a compensation of $1500 per annum was appointed for each of the two coasts; a keeper was assigned to each station at a salary of $250; the stations and their equipments were made serviceable, and bonded custodians were secured for the life-boats. The service, however, still lacked drilled and disciplined crews, regulations, and a central energetic administration of its affairs. An effort made in 1869 to procure from Congress an appropriation to provide for crews of surfmen, resulted in securing these crews for each alternate station, and in 1871 the Secretary of the Treas-

ury, to whose department the Life-saving Service —owing to its relation to commerce—belongs, was authorized to employ crews of surfmen at such stations and for such periods as he might deem necessary. From that year the present organization of the service may be said to date. An appropriation of $200,000 was made by Congress for its support, and an efficient chief was found in the person of Mr. Sumner I. Kimball, who, in February of the same year, had taken charge of the bureau of the Revenue Marine Service, to which the administration of the Life-saving Service at that time belonged. Setting vigorously to work, Mr. Kimball, by means of thorough inspection, acquainted himself accurately with the existing state of the service and the steps necessary to remedy its defects, and so satisfactory were the results of his efforts that the record of the season's operations (1871–72) on the coasts of New Jersey and Long Island, where the system had been most fully developed, show that every person imperiled by shipwreck was saved. The success of this season stimulated renewed effort and encouraged further development. New stations were established; a code of regulations was prepared, and improved apparatus was selected for the stations, including the New Jersey cedar surf-boat, an *éprouvette* mortar, the india-rubber life-saving dress invented by Mr. C. S. Merriman, and Coston night-signals. Without attempting to follow year by year the successive stages of development, it must suffice to say that, under the fostering care of Congress and efficient administration by its chief, the Life-saving Service continued to improve and expand, until it had so demonstrated its usefulness that, on the 18th of June, 1878, Congress passed an act detaching it from the Revenue Marine and erecting it into a separate and definite establishment. As now organized the establishment embraces 12 districts, comprising 195 stations, which are divided into 3 classes, known respectively as life-saving stations, life-boat stations, and houses of refuge. The following table shows the location of the districts, and the number and class of the stations belonging to each district:

Districts.		Stations.	
No.	Coasts.	No.	Class.
1	Maine and New Hampshire	7	Life-saving.
2	Massachusetts	15	"
3	Rhode Island, Block, and Long Islands	38	"
4	New Jersey	40	"
5	Delaware, Maryland, and Virginia to Cape Charles.	11	"
6	Virginia and North Carolina, from Cape Henry to Cape Fear	25	"
7	Florida	5	Houses of refuge.
8	Gulf of Mexico	6	5 life-saving. 1 life-boat station.
9	Lakes Erie and Ontario	9	3 life-saving. 6 life-boat stations.
10	Lakes Huron and Superior.	13	10 life-saving. 3 life-boat stations.
11	Lake Michigan	18	5 life-saving. 13 life-boat stations.
12	Pacific	8	Life-boat stations.

The life-saving stations have houses two stories in height, and from 18 to 20 feet wide, by 40 to 45 feet long. They are neat and tasteful in appearance, and contain on the ground-floor 2 rooms, one, the boat-room, about 10 by 16 by 30 feet, which opens to the weather by a broad double-leaved door. In this are stored the boats, life-car, wreck-gun, and most of the apparatus. The other room, measuring about 8 by 12 by 16 feet, is the common living-room of the crew. In the second story are 3 rooms, one for storage, one the keeper's sleeping-room, and one that of the men, these two sleeping-rooms being furnished with some extra cots for use in emergency. At stations having signal-service communication there is an additional room in the upper story for the signal-officer.

The houses at life-boat stations are usually 24 feet from base to peak, 42 feet long by 22 feet wide, outside measurements, and contain a loft above, and a room below 12 feet high, 20 feet wide, and 40 feet long, for the accommodation of the life-boat and its gear. They stand on piles at the water's edge or on the inner side of the piers, and are furnished with an inclined platform or trap in the floor, along which the life-boat is let down and launched by means of a windlass.

The houses of refuge, which exist only on the Florida coast, are two-story structures, having broad gabled roofs, a veranda 8 feet wide on three sides, and large chimneys in the rear, built outside the wall. They are of pine, elevated about 6 feet from the ground, and the roofs are shingled with cypress. The windows are fitted with wire-gauze mosquito netting in place of glass. The houses are about 37 feet long by 15 wide, not including the veranda space. The lower story has 3 apartments, the upper is not divided into apartments. Each house has capacity for succoring 25 persons, and has a 10 days' supply of food for that number. A boat-house is provided for each station, furnished with a galvanized iron boat with sculls.

The *personnel* of the Life-saving Service consists of a general superintendent and an assistant general superintendent, their headquarters being in the Treasury at Washington; an inspector of life-saving stations, who is an officer of the Revenue Marine; 2 superintendents of construction of life-saving stations, who are also officers of the Revenue Marine, and who supervise the erection and repairs of buildings, and the purchase of equipments for new stations. Their office is in New York. An officer of the Revenue Marine is assigned to each district as assistant inspector, his duty being to see that the stations and their equipments are in proper condition, and the crews proficient in the use of the life-saving apparatus. The districts are severally in charge of a superintendent, who is appointed after examination, and is required to be an inhabitant of the region, familiar with the coast, and with the action of surf and the use of surf-boats and other life-saving apparatus. He is responsible for the condition and conduct of his district, makes requisition for all repairs, outfits, and supplies therein necessary, pays the crews, keeps the accounts, and conducts the correspondence. For the Rhode Island portion of the third district there is also an assistant superintendent, who resides at Block Island. The superintendent nominates the keepers of his district, who are subject to an exami-

nation by a board consisting of the local inspector, a surgeon of the Marine Hospital Service, and an expert surfman. Each station is in charge of a keeper. He selects his own crew, subject, however, to the revision of the Examining Board. He is by law an inspector of customs, and has authority to take charge of stranded property, and to prevent smuggling. He keeps inventories of all property pertaining to his station, and a journal of events, weekly transcripts of which are sent to the general superintendent. He is responsible for the good order of the station and its appointments, commands the crew, and conducts all operations. At complete life-saving stations the keepers are required to reside constantly with their crews during the active season. At life-boat stations, with only volunteer crews, the keepers must live in the neighborhood, keep sharp look-out for vessels in distress during thick weather, and rally their men upon occasions of need. At houses of refuge the keepers live with their families the whole year, and after storms the beach is thoroughly searched to the greatest extent practicable in both directions for persons cast ashore, who, when found, are succored and tenderly cared for. The crews of life-saving stations consist of 6 men, who are required to be hardy and skilled surfmen. They constantly patrol the beaches at night with lanterns and night-signals, and also watch by day, especially in thick weather. This system of patrolling is a distinctive feature of the United States Life-saving Service, and its proved value in speedily discovering stranded vessels causes it to be maintained with great vigilance, the manner of its performance to be strictly watched, and any evasion of duty in connection with it to be promptly punished. The volunteer crews at the life-boat stations are groups of 8 persons besides the keeper. They are regularly enrolled, and are required to be vigilant to observe the signal for their assembly in thick or stormy weather. See LIFE-BOATS AND RAFTS, LIGHT-HOUSE ESTABLISHMENT, WRECK ARTILLERY, DROWN.

Lift. To shake slightly, as a sail when the wind blows against it at too small an angle. To raise, as a vessel, when lifted out of the water by a floating-dock. Fog is said to *lift* when it rises from the surface of the water. A promotion is sometimes called a *lift*. "*Give me a lift*" is a request for assistance in work. A *lift* is a rope which extends from the mast-head to each end of a yard to support the yard-arms. A yard is "*on the lifts*" when its weight is supported by the lifts. A *topping-lift* supports the outer end of a lower studding-sail boom and a spanker-boom.

LIFTING-JACK. A portable machine for lifting heavy objects.

LIFTING-PUMP. One by which the liquid is lifted by the piston, instead of being forced to the place of discharge.

LIFTING-ROD. The rod which receives motion from the rock-shaft of the valve-gear, and imparts motion to the poppet, or other lifting-valve.

LIFTING-TOE. The revolving arm on the rock-shaft of the valve-gear, which takes against the toe on the lifting-rod and thus transmits motion.

Lig (*Eng.*). A small fish-hook with lead cast on its upper end to serve as a sinker.

Ligan. A term in maritime law signifying goods that are sunk in the sea, but whose position is marked by buoys.

Ligger (*Eng.*). A contrivance for taking pike at night.

Light. Small; inconsiderable. Not dark. The term for all lamps or lanterns used on shipboard; as, *running lights*, *signal-lights*, *mast-head lights*, etc. (See LANTERN.) Open lights on the berth-deck require to be extinguished on a ship of war at 8 P.M., in the steerage at 9 P.M., and in the ward-room at 10 P.M., unless permission is given for an "extension of light" by the commanding officer. To lift or carry anything along the deck; as, "to light along a rope." *To light over to windward* is to haul the reef-band to windward when reefing a sail. A ship is *light* when she has no cargo, or is not deeply immersed; and she is said to be *flying light* when she is crank for want of ballast or cargo.

LIGHT AIR. Wind of least force. It is indicated by the figure 1 in the scale, where 0 represents a calm and 12 a hurricane.

LIGHT-BALLS. Balls sometimes used in military operations for lighting up the enemy's works at night. They are composed of inflammable substances, such as sulphur, saltpetre, and resin, with oil, and burn with great brilliancy in mid-air when fired from a mortar.

LIGHT-BOX. The place, adjoining a magazine or shell-room, for the magazine-light. The light is transmitted to the magazine through a thick glass plate.

LIGHT BREEZE. A steady wind, whose force in indicated in the scale by 2.

LIGHTEN. To relieve a vessel in stress of weather by throwing overboard cargo or any heavy weights.

LIGHTER. A large flat-bottomed barge or boat used in transporting cargo between a vessel and the shore. It is built with great strength, and may be open or covered with a deck, according to the kind of merchandise which it is intended to carry.

LIGHTERAGE. The price paid for the use of lighters, or the cost of transporting a vessel's cargo in loading or unloading by lighters.

LIGHTERMAN. A man who is employed on a lighter.

LIGHT-HANDED. Short-handed. A crew smaller than the complement allowed.

LIGHT-HORSEMAN (*Eng.*). An old name for the gig.

LIGHT ICE. Thin ice.

LIGHT-PORT. Any port used to admit light into the hold of a vessel.

LIGHT SAILS. Topgallant sails, royals, flying-jib, and studding-sails.

LIGHT-SHIP. A small vessel constructed for the purpose, and furnished with one or two large lanterns of great illuminating power. They are anchored upon shoals or in the vicinity of dangers to which vessels are exposed, either on the coast or in harbors.

LIGHT WATER-DRAFT. The draft when the hull is entirely empty.

LIGHT WATER-LINE. The line of immersion of a vessel when unloaded.

Light-house Establishment (The), of the United States is not a creation: it is a growth. The first light-house was built on Little Brewster Island, Boston harbor, Mass., in 1715-16, by

order and at the expense of the General Court of the Province of Massachusetts Bay, at an outlay of £2385 17*s.* 8½*d.*, and it was supported by "an impost of 1*d.* per ton inward and 1*d.* per ton outward" on all passing vessels except coasters, paid to the collector of imposts at Boston. Other lights were erected on various parts of the coast as the necessities of commerce required, so that in 1789 there were 25 light-houses: 2 in Maine, 1 in New Hampshire, 10 in Massachusetts, 1 in Rhode Island, 2 in Connecticut, 1 on Long Island, N. Y., 1 on Sandy Hook, N. J., 3 in Virginia, 1 in North Carolina, 1 in South Carolina, and 1 in Georgia.

The United States, by act of 7th August, 1789, assumed, with the consent of the States owning them, the control, proprietorship, and maintenance of these lights, and placed them under the management of the Secretary of the Treasury, who devolved their superintendence upon his subordinate, the Commissioner of Revenue, until July, 1820, when his office was abolished, and the duty was assigned to the Fifth Auditor of the Treasury, who, in 1852, turned it over to the Light-House Board, by which it is still exercised.

In 1789 there were 25 light-houses; in 1820 there were 55; in 1838 there were 210 light-houses, 28 light-ships, and numerous buoys and beacons; in 1852 there were 325 light-houses, 42 light-vessels, more beacons and more buoys; and now the number of lights has more than doubled, various other aids to navigation have been devised, and the establishment has increased many fold in usefulness.

Collectors of customs have had certain limited and local care of lights and light-keepers from the first. Since the charge of the lights was assumed by the general government the method of caring for the *personnel* of the establishment has been subjected to frequent modification; and now those collectors, who are also superintendents of lights, have nothing to do with light-houses, and no further connection with the keepers than to nominate them for appointment, and in most instances to pay them their wages. In the beginning collectors contracted for the erection of light-house buildings, and the purchase of all the material used in building, operating, and maintaining the lights. When the Fifth Auditor became general superintendent he took supervision of these contracts, and in some instances made them himself, and he attempted the formation of a system which had in it germs of success. But the needs of commerce increased more rapidly than this crude plan could meet them. Hasty legislation overran itself, and Congress became aware of the necessity for revising its own action. Hence, in May, 1838, it created a board of naval officers to examine and report as to the lights which were actually needed, and also as to how those needs were met by existing lights and by those to be erected. On the report of that commission Congress took such action that the erection of 31 lights, for which appropriation, plans, and, in some instances, contracts had been made, was stopped; the coasts were divided into 7 districts, a young and active naval officer was assigned to each, and appropriation was made for the purchase and practical test, in light-houses, of two sets of French lenticular apparatus. These officers, who were required to report among other things as to the plan, site, and need for each proposed light-house, did their duty so thoroughly that Congress for the first time had a full and clear knowledge of the real needs of commerce, and was enabled to provide for and meet its immediate necessities.

But the wants of shipping again outgrew these new plans, and complaints were so numerous and specific that, in March, 1851, another, and now a mixed, commission was raised, and required by law "to inquire into the condition of the light-house establishment, and to make a general detailed report and programme to guide legislation in extending and improving our present system of construction, illumination, inspection, and superintendence." This commission, which was composed of three naval officers, two army officers, and the superintendent of the coast survey, made a thorough examination of existing aids to navigation, compared them with those of France and other maritime countries, which were visited for the purpose, and then prepared a plan which was intended to combine the best features of the various foreign systems, to adapt them to the ascertained wants of this country, and to provide for its wants in the future. This plan, which was submitted with a full report, was adopted in the main by Congress, and the act of August 31, 1852, created the Light-House Board, placed the Light-House Establishment under its direction, attaching it to the office of the Secretary of the Treasury, making him its president, and placing it under his superintendence. This board was directed by the organic act "to discharge all the administrative duties relating to the construction, illumination, inspection, and superintendence of light-houses, light-vessels, beacons, buoys, sea-marks, and their appendages, and embracing the security of foundations of works already existing, procuring illuminating and other apparatus, supplies and materials of all kinds for building and rebuilding when necessary, and keeping in good repair the light-houses, light-vessels, beacons, and buoys of the United States."

The new board was composed of 9 members: 3 officers of the navy, two of high rank, 3 officers of the corps of engineers of the army, and 3 civilians, one of whom was to be the Secretary of the Treasury, and the remaining two to be of high scientific attainments. The members of the commission were appointed on the board, which was completed by adding to it Prof. Joseph Henry, the secretary of the Smithsonian Institution, and Capt. E. L. F. Hardcastle, of the corps of engineers, when it was organized by making Commodore Shubrick its chairman, Lieut. Jenkins its naval secretary, and Capt. Hardcastle its engineer secretary.

The board then commenced making the recommended reforms. The coasts of the Atlantic, the Gulf of Mexico, the Pacific, and the great lakes were divided into 12 districts, to which the two districts constituting the great Western rivers were added in 1874; and an inspector and engineer, who was in each case an officer of the army or navy, was assigned to each district. The inspectors, under the special direction of the naval secretary,—who also had charge, in the absence of the chairman, of the office of the board,—were charged with the maintenance of light-houses and lights, and with the discipline

of the light-keepers; and the engineers, under the direction of the engineer secretary, were charged with building the light-houses, with keeping them in repair, and with the purchase, the setting up, and the repair of the illuminating apparatus. Both inspectors and engineers were required to make regular and special reports to the board, acting always under its direction; and the board was required to make a full annual report to the Secretary of the Treasury, who in turn reported to Congress.

The board divided itself into committees on engineering, lighting, floating aids to navigation, location of light-houses, experiments, and finance, and placed an expert in that branch at the head of each. Its committee meetings were frequent, and the board itself met at least monthly, though required by law to meet but quarterly, while the executive committee, consisting of the chairman and the two secretaries, were in constant session, and carried on the business of the establishment. The individual members of the board had much work to do along all the coasts of the country, and thus became familiarized with the minutest details of the service, which was soon placed on the best possible footing. Then the board set about making all desirable improvements as fast as existing laws and funds in its control would permit.

It substituted for the old parabolic reflectors the lenticular illuminating apparatus of Fresnel, making at once a great saving in expense for oil, and a great increase in the light produced. It substituted light-houses for light-ships where possible, making large saving in expense for maintenance in each instance, again with a corresponding increase in light. After a long course of experiments, in which it was joined by some of the first scientists of the country, the board found it possible to substitute as an illuminant, lard oil for sperm, and invented and manufactured lamps in which to burn it, with a further saving in cost and another increase in the power of the light. After a series of experiments into the nature and action of sound in wind, rain, fog, and snow, running through many years, with published results, stimulating private enterprise and ingenuity, it tested and finally adopted a number of fog-signals, operated by steam, hot air, or by the action of the waves, and appropriately placed them as rapidly as funds were provided by Congress, and brought that part of the service into such perfection that mariners were satisfied to be guided by sound when sight was impossible, and that other maritime nations sent commissions here to study our methods. It inaugurated a simple and inexpensive system of lighting the great Western rivers, which is so successful that steamers, which formerly tied up on dark nights, now run as in daylight, thus revolutionizing the river commerce of the country. It has recently, after another exhaustive series of experiments, as a measure of economy, substituted mineral oil for lard oil as an illuminant in its lights of the lower orders, certainly with no loss of light thereby. It has so far pushed its experiments into the use of the electric light as to become sensible of its possibilities for light-house illumination, and to ask Congress—thus far unsuccessfully, however—for funds with which to practically test it in a light-house.

The board has elevated the character of its *personnel*, and has, after long effort, succeeded in withdrawing the promotion and transfer of light-keepers, over a thousand in number, from politics and making them depend on merit. It has provided for light-keepers, in addition to a well-arranged volume of printed instructions, some 250 small libraries, each containing about 50 volumes of general literature, which pass from light-station to light-station as they are read; and it is within its plans to place the service on a still higher footing. The members of the board serve without any pay additional to that which they receive by right of position in the army, navy, or civil service. They now are, and as a rule they have been, persons of scientific attainments, and because they were noted as such were detailed for light-house service.

On July 1, 1880, the Light-House Establishment had in position 47 first-order lights, they being the largest, 26 of the 2d order, 55 of the 3d order, 10 of the 3½ order, 204 of the 4th order, 288 of the 5th and 6th order; 24 lanterns and lenses, 819 stake-lights on the Western rivers, 31 light-ships, 57 fog-signals, operated by steam or hot air, 25 automatic whistling-buoys, numerous day-beacons or monuments, and 3115 other buoys.

The establishment is entirely supported by the general government, without making any charge in the way of light-dues against vessels of any country. Its cost may be predicated upon appropriations made for the support of the establishment during the fiscal year ending June 30, 1881, which were as follows:

For salaries of keepers of light-houses, at an average of $600 each, $565,000; for expenses of light-vessels, $240,000; for expenses of buoyage, $325,000; for expenses of fog-signals, $50,000; for inspecting lights, $4000; for supplies of light-houses, $375,000; for repairs of light-houses, $285,000; for erection and repair of pier head-lights, $25,000; for lighting and buoyage of the Mississippi, Missouri, and Ohio Rivers, $140,000; for survey of sites and preparation of plans of light-houses, $10,000. Total for maintenance of the service one year, $2,019,000. For the erection of new light-houses and the building of new light-vessels, $476,700. Grand total, $2,495,-700.—*A. B. Johnson, Chief Clerk Light-House Board.*

Lightning-conductor. A small rope of copper wire which extends from the truck of each mast to the metallic sheathing on the vessel's bottom. The upper end of the wire rope terminates in a steel point, tipped with platinum, which is fastened to the upper side of the truck.

Lignamina (*Eng.*). Timber for building purposes.

Lignite. Fossil wood carbonized to a certain degree, but retaining its woody texture. See Coal.

Lignum-vitæ. A tree (*Guaiacum officinale*) found in the West Indies and Central America. On account of the extreme hardness of its wood it is valuable for the sheaves of blocks.

Limb. A portion of the disk of the sun or moon. The graduated arc of a mathematical instrument.

Limbers or Limber-holes. The holes cut through the floor-timbers for the passage of water on each side of the keelson.

Limber-board. A short plank fitted into the

floor of a vessel, which can be removed when necessary to clear the limber-holes.

LIMBER-CHAIN. A small chain rove through the limber-holes or limbers, by moving which the holes can be cleared of dirt, and passage given for the water in the bottom to run into the pump-well.

LIMBER-PLATE. See LIMBER-BOARD.

LIMBER-STREAK. The plank in the floor of a vessel nearest the keelson.

Limbo. A place of confinement.

Lime-juice. Issued in the English naval service as a part of the ration, on account of its antiscorbutic qualities.

Lime-pot. A pot for holding lime, which was used in the early time of European naval engagements for its blinding effects upon the enemy.

Limerick, the leading port of Ireland, is situated on an extensive plain at the interior extremity of the estuary of the Shannon, in lat. 52° 39′ 36″ N., lon. 8° 39′ W. The harbor is about 1600 yards in length by 150 in breadth, with from 2 to 9 feet at low water and 19 feet at the spring tides. The commerce of the port is considerable. The manufacture of lace and fish-hooks has supplanted that of gloves and linen, for which this city was at one time celebrated. There are also distilleries, breweries, ship-building yards, flour-mills, and foundries. Pop. 40,000.

Limiting Parallels. The most northern and southern parallels of latitude within which occultations of the stars or planets with the moon can take place.

Limmer (*Eng.*). The man-rope at the side of a ladder.

Limnoria. A genus of crustacea of the order *Isopoda*, containing only one known species. It does great damage by eating into docks, piles, and other wood-work immersed in the sea. The kyanizing of wood and other expedients have been resorted to to prevent its ravages.

Limpet. A shell-fish of the genus *Patella*, found adhering to rocks.

Linch-pin. An iron pin by which the truck of a gun-carriage is secured upon the axle.

Line. A common term for the equator. The word is applied to many ropes of different sizes which are used for various purposes on shipboard; as, *bow-lines*, *bunt-lines*, *clew-lines*, *leech-lines*, *spilling-lines*, etc. (See SAILS.) Also, marline, houseline, roundline, etc. (See SMALL STUFF.) A small hawser used in towing is called a *towline.* A small rope used for hauling the end of a hawser on board is called a *hauling-line.* A *tripping-line* is used for clearing the lower lift and brace from the yard-arm in sending down a topgallant or royal yard. *To line*, to mark out work in ship-building; to put such lines upon the work as will show its finished shape, to which the workmen are to cut. To place anything in its true position. Also, to protect anything with boards, sheet-iron, lead, etc.

LINES OF A VESSEL. The boundaries or curves generated by planes cutting the solid in different directions, the boundary or curve being defined by the contact of said plane with the surface of the solid.

They are, 1st. The "*water-lines*," which are generated by cutting the solid with horizontal planes.

2d. "*Cross-sections*," or frame-lines, generated by cutting the solid by vertical transverse planes.

3d. "*Vertical sections*," which are generated by cutting the solid with vertical longitudinal planes.

4th. "*Diagonals*," which are generated by cutting the solid with a plane whose contact with the "vertical longitudinals" is horizontal, but whose surface transversely is inclined, in order that the plane may approach a perpendicular to the surface of the solid at its point of contact.

Beam-line, a line showing the height of the beams at the sides of the ship. *Bearding-line*, the trace of the inner surface of the skin on the stem, keel, and stern-post. *Boundary-line*, the trace of the outer surface of the skin on stem, keel, and stern-post. *Bow-* and *buttock-lines*, the lines formed by the intersection of a vertical plane parallel with the plane of the keel, and the bow and quarter of the ship. *Centre-line*, any line formed by the middle, vertical, longitudinal section. *Cutting-down line*, a line on the sheer-plan, corresponding to the upper surface of the floor-timbers at the centre-line. *Diagonal lines*, lines formed by the passing of planes oblique to the plane of the keel, but intersecting that plane in lines parallel to the keel. *Level lines*, lines formed by planes perpendicular to the plane of the keel. *Main-breadth line*, the line which shows the greatest breadth of the ship. *Ribband-line*, the same as a diagonal line. *Sheer-line*, a line showing the upward curvature at the extremities of the ship. *Stepping-lines*, the lines upon which are stepped the heels of the cant-timbers,—the forward and after ends of the bearding-line. *Load water-line*, the line of flotation when the ship has her full cargo on board. *Light water-line*, the line of flotation when all the cargo is discharged.

LINE OF BATTLE. The line formed by the ships of a fleet at regular intervals ahead and astern, and nearly close-hauled upon either tack. This mode of forming line of battle applies rather to the former days of sailing fleets, where one of the objects of manœuvring was to obtain the weather-gauge of an enemy, than to the present age of ironclad vessels and steam.

LINE-OF-BATTLE SHIP. A ship carrying not less than 74 guns upon three decks, and of sufficient size to be placed in line of battle.

LINE OF BEARING. The position of the vessels of a fleet in line heading in any direction from which, by hauling upon the wind, a line of battle is formed. A fleet is on the starboard line of bearing when, by coming to the wind, the ships will be in line of battle on the starboard tack. Otherwise they are on the port line of bearing.

LINE OF COLLIMATION. The line which passes through the centre of the telescope of an astronomical instrument at the intersection of the cross-wires at its focus.

LINE OF FIRE. The prolongation of the axis of the bore of a gun when fired.

LINE OF FLOTATION. The horizontal line formed by the surface of the water on the outer surface of a vessel at different drafts.

LINE OF LINE. One of the lines upon Gunter's rule, by the use of which a given line can be divided into equal parts, third and fourth proportionals found, or a line increased in any proportion desired.

LINE OF METAL. That line drawn from the upper point in the base-ring to the upper point

of the muzzle which lies in the perpendicular plane of the axis of the bore.

LINE OF METAL ELEVATION. The elevation of a gun when the line of metal is horizontal; caused by the dispart of the gun.

LINE OF NODES. The line which passes through the nodes of an orbit.

LINE OF SIGHT. The right line which passes through the points of sight of a fire-arm.

LINE OF VESSELS. Vessels owned by the same company or person, and plying regularly between certain ports.

LINER. A ship of the line. One of a line of vessels.

LINING-CLOTHS. Canvas sewed in certain places upon the after side of a sail to protect it from chafe.

Line-officers. The combatants as distinguished from the non-combatants. See STAFF-OFFICERS.

Below is a list of the line-officers of the navy, showing the corresponding rank of officers of the army:

Admiral with General.
Vice-Admiral with Lieutenant-General.
Rear-Admiral with Major-General.
Commodore with Brigadier-General.
Captain with Colonel.
Commander with Lieutenant-Colonel.
Lieutenant-Commander with Major.
Lieutenant with Captain.
Master with First Lieutenant.
Ensign with Second Lieutenant.
Midshipman.
Cadet-Midshipman.

Mate, Boatswain, and Gunner, not in the line of promotion. For the duties of line-officers, see under proper heads.

See COMMANDER-IN-CHIEF, CHIEF-OF-STAFF, COMMANDING OFFICER, EXECUTIVE-OFFICER, NAVIGATOR, WATCH-OFFICER, OFFICER OF THE DECK.

Ling. A marine fish (*Lota molva*), something like the cod, but more slender, and having only two dorsal fins. It is largely used as food in Scotland and Ireland.

Linget. Small bullets or slugs cast in molds.

Lingo. A slang term for language.

Link. A single division of a chain. A rod or piece to transmit power from one part of a machine to another. Also, a Scottish term for a curve of a river.

LINK-MOTION. A system of mechanism composed of the eccentric-rods, link, link-block, valve-stem, etc., common in locomotives and marine engines, for reversing and stopping the engine, and can be used within narrow limits as a variable cut-off.

The principal kinds are the "*Stephenson shifting link-motion*," the "*Gooch stationary link-motion*," the "*Allan link-motion*," and the "*Walschaert link-motion.*"

LINK-WORMING. Formerly, when rope-cables were in use, the part of the cable near the anchor which would be liable to injury from a rocky bottom was protected by worming them with chains; hence called link-worming.

Linkister (*Eng.*). An interpreter.

Linstock. A short staff for holding a match-rope by which guns were formerly fired. Its lower end was shod with an iron point, which could be stuck into the deck when required.

Lintre. An ancient canoe.

Lip. An obsolete term for notch. To notch the edge of a sword. *Lips of a scarf*, the thin ends of the timbers which are scarfed.

Lipper (*Eng.*). See LEAPER.

Lira. An Italian coin of the value of $0.19.

Lisbon, the capital of the kingdom of Portugal, is situated on the right bank of the Tagus, near its mouth in the Atlantic Ocean, in lat. 38° 42′ 4″ N., lon. 9° 8′ 2″ W. The scientific institutions comprise the Royal Academy of Sciences, College of the Nobles, Royal Marine Academy, School of Navigation and Ship-building, Royal Academy of Artillery and Engineers, and Royal Military College. The harbor is one of the finest in the world; and the quays, which extend between 2 and 3 miles along the bank of the river, are elegant and commodious. The commerce is extensive. The exports consist of wine, oil, fruit, and salt, and the imports, hemp, flax, corn, iron, steel, hardware, etc. Pop. 254,000.

Lisbonine. The denomination of the moidore. A Portuguese coin of the value of $6.00.

L'Isle Adam, Philippe de. Forty-third grand master of St. John of Jerusalem, was born at Beauvais, 1464; died at Malta, 1534. He is renowned as the commander at Rhodes when that city was besieged, in 1522, by the Sultan Solyman the Great, with 200,000 Turks. The siege of the city is one of the most memorable in history. It reads like romance, and is too full of incident for even a sketch to be given in this place.

The grand master, with between 600 and 700 knights, and about 5000 men-at-arms, conducted the defense successfully for six months, the most heroic courage and devotion being shown by all, while the tremendous fire and obstinate perseverance of the Turks in their desperate assaults was quite as remarkable.

At last, after most terrific slaughter on both sides, and the death of most of the knights upon the battlements, an honorable capitulation was obtained, and the order retired from Rhodes, to wander about for the next eight years without a permanent seat.

In 1530 they obtained from Charles V. the cession of Malta and Gozo: and from that time the chevaliers of the order took the name of Knights of Malta. They had not long taken possession when L'Isle Adam died, his death being hastened, it is said, by grief at the dissensions which arose in the order.

His tomb, in the crypt of St. John, is one of the most interesting in that very curious church. —*E. Shippen.*

Lissom. Nimble; active.

List. Said of a vessel that leans to one side or the other; as, "The ship is listed to starboard," or, "She has 2° list to port."

Lister (*Eng.*). A spear for taking salmon.

Listing. A narrow strip cut from the edge of a plank.

Lithofracteur. An explosive mixture manufactured in Cologne, and used to considerable extent in Europe for mining purposes. Its composition is as follows:

Nitro-glycerine,	52	per cent.
Kieselguhr,	30	"
Coal,	12	"
Soda saltpetre,	4	"
Sulphur,	2	"

Litter. A temporary bed upon which a wounded person is carried.

Littoral (Fr. *littoral*, sea-coast). The sea-coast. The space between high- and low-water marks. Pertaining to, or growing on, the shore.

LITTORALA. A coaster of ancient times.

Live. To withstand a tempest without foundering; as, "The boat cannot *live* in such a sea."

Lively. Said of a vessel that is quick in her motions.

Live-oak. A species of timber used in ship-building, valued for its density and durability.

Liverpool, in Lancaster County, England, on the east bank of the Mersey estuary, 4 miles from the Irish Sea, in lat. 53° 24′ 3″ N., lon. 3° 4′ 17″ W., is one of the largest seaports in the world. Along the shore a line of docks and basins extends over 5 miles in length, having an aggregate water area of 300 acres and a quay space of 20 miles, reclaimed from the river. Some of the docks are connected with the Leeds and Liverpool Canal, and most of the others have half-tide locks and wet-basins. The London and Northwestern, Lancashire and Yorkshire, Great Northern, Manchester, Sheffield and Lincolnshire and Midland Railways have extensive stations close to the docks, and the Great Western Railway has access to Birkenhead, on the opposite side of the river, with which there is constant communication by steam-ferries. The town has extensive and varied manufactures, and shipbuilding is carried on to a great extent, but it owes its chief importance to its being a great seat of foreign export and import trade. The Mersey, at high-water, may be entered by the largest ships. Regular lines of the finest steam-packets in the world ply between Liverpool and Glasgow, Dublin, Cork, Bristol, and the principal ports of France, the Mediterranean, America, India, Australia, China, and Africa. Pop. 520,000.

Live-shell. A loaded shell.

Live-steam. Steam direct from the boiler at full pressure; in contradistinction to dead-steam, exhaust-steam.

Livid Sky. The dark leaden color of the clouds which precede a storm.

Livingston, John W., Rear-Admiral U.S.N. Born in New York. Appointed from New York, March 4, 1823. Midshipman in sloop-of-war "Ontario" and frigate "Delaware" in the Mediterranean, and in frigate "Constitution," at close of "piratical war" in the West Indies.

Commissioned as lieutenant, June 21, 1832, and served as a watch-officer in brig "Dolphin" and sloop "Fairchild" in the Pacific, and in frigate "Columbia" on a voyage around the world, visiting Sumatra, and destroying the piratical establishments on that island, and as executive-officer (a portion of the time in command) in the frigate "Congress" on the coast of California and Mexico during the entire Mexican war; was present at the capture of Guaymas and San Blas, and in the various operations in California.

Commissioned as commander, May 24, 1855; commanding sloop-of-war "St. Louis" on coast of Africa, 1856–58; commanding steamer "Penguin," Blockading Squadron, 1861–64; while off Wilmington, N. C., chased and destroyed a blockade-runner; commanding steamer "Bienville," Blockading Squadron, 1861; commanding frigate "Cumberland," James River Blockade, in early part of 1862.

Commissioned as commodore, July 16, 1862. After the evacuation of Norfolk by the rebels, Commodore Livingston was ordered there in command of navy-yard, with directions to restore the dry-dock, so it might be available for the repair of our Southern cruisers. In 1864, he was detached from the Norfolk Yard, and in 1865 ordered to the command of the Naval Station at Mound City, Ill., and the remaining vessels of the Mississippi Squadron. In 1866 he was detached from this duty and ordered to special service.

Commissioned as rear-admiral, May 26, 1868. Retired May 22, 1866.

Lizard. A piece of rope with a thimble spliced into one or both ends, used in different parts of a vessel as a leader for ropes. The *bunt-line-lizard* hooks to the topsail-tye near the yard and serves as a leader for the topsail buntlines, which are rove through the thimbles at the ends. A lizard is used on a light yard for stopping the yard-rope out on the quarter of the yard previous to sending it down from aloft.

Lloyd's (*Eng.*). A society of underwriters established in London since 1601, by whom the classes and rates of vessels are established and registered, and the principal business of British marine insurance carried on.

LLOYD'S AGENT (*Eng.*). A person employed in any port for attending to the interests of the board of underwriters called Lloyd's, to send commercial information, assist vessels, etc.

LLOYD'S LIST (*Eng.*). A journal devoted to commercial interests, published daily.

LLOYD'S REGISTER (*Eng.*). The annual publication of the list and register of British and foreign shipping.

LLOYD'S SURVEYOR (*Eng.*). One who surveys or examines the condition of vessels for the underwriters.

Loach. A small fish allied to the minnow, of the genus *Cobitis* (*C. barbatula*), inhabiting small, clear streams, and esteemed dainty food (written also *loche*).

Load. To insert the charge and projectile in a fire-arm. To take cargo on board.

LOADED SHELL. A shell filled with powder and fused.

LOADING, DENSITY OF. The proportion between the cubical contents of the powder-chamber and the space occupied by the powder.

LOADING-TRAY. A metallic shelf by which the shell of a breech-loading cannon is placed in the bore.

LOAD WATER-LINE. The line of immersion when a vessel is loaded.

LOAD WATER-SECTION. The horizontal section of a vessel at the load water-line.

Loadsman. An obsolete term for a pilot.

Loadstar, or Lodestar. The pole-star. Any guiding star.

Loadstone, or Lodestone. A natural magnet.

Loam. A mixture of sand and clay used in molding.

Loath to Depart. The name or commencement of a popular song which is frequently mentioned in the annals of the English navy during the 17th century. The air was played upon the trumpets at the departure from a vessel of a distinguished visitor, and also previous to sailing, as a signal for the ship to be cleared of visitors.

Lob. Stupid; slow. Hence, *looby* or *lubber*

Lobby (*Eng.*). The name sometimes given to the passage-way in the forward part of the cabin.

Lob-cock. A contemptuous term for a sluggish, lazy person.

Lobipedidæ. A family of birds of the order *Grallæ*, having toes separately margined with a scalloped membrane. They frequent salt as well as fresh water, and are sometimes seen far at sea on patches of sea-weed.

Loblolly. A former name for gruel or porridge.

LOBLOLLY-BOY. The sick-bay attendant. Now called *bay-man* or *nurse.*

Lobscouse, or Lops-course. A stew composed of vegetables, meat, and hard bread.

Lobster-boat. A boat used by lobstermen, fitted with a tank, in which the lobsters are kept alive.

Lobster-toad. A kind of crab.

Lob-tail. The sperm whale is said to be lobtailing when it beats the water with its tail.

Lob-worm, or Lug-worm. The *Arenicola piscatorum.* It is highly esteemed for bait on the coasts of Europe.

Local Attraction. The force exerted upon the needle of the compass by the iron in the vicinity.

Local Deviation. The deviation or error in a ship's compass caused by the iron in the vessel's construction, her guns, etc.

Local Time. See TIME.

Loch. A Scotch or Irish lake or arm of the sea.

Lock. That part of a small-arm or great gun by which fire is communicated to the charge. An inclosure in a canal for the purpose of raising or lowering vessels from one level to another. To entangle the lower yards of a short ship while tacking.

LOCKAGE. Charges for passing a vessel through a lock.

LOCK-FAST. An attachment to the lock of a breech-loading fire-arm.

LOCKING-IN. The position of the clews and bodies of the alternate hammocks when hanging on the hooks.

LOCK-LUG. The mass or raised portion on the surface of a gun to which the lock is attached.

LOCK-NUT. A supplementary nut, screwed down on a primary one to prevent the latter from turning, or slacking up.

LOCK, STOCK, AND BARREL. The whole of anything.

LOCK-UP SAFETY-VALVE. A safety-valve which, with its weight, is so inclosed in a box and locked up that it cannot be tampered with. A rod extending up through the box enables the engineer to blow off, and it can be inspected at any time by the proper person having the key.

Locker. A small closet where articles may be locked up, or a compartment in a vessel used for the stowage of certain articles; as, a *shot-locker*, where solid shot are kept; the *chain-locker*, where the chain-cables are stowed. *Davy Jones's locker* is the bottom of the sea.

Locket. The metallic case at the end of a sword scabbard.

Loc-man, or Loco-man (*Eng.*). A former name for a pilot.

Locomotive-power, or Motive-power. The power by which a change of place is produced, as the sails acted upon by the wind, or steam.

Lodemanship, or Lode-manege. An ancient name for seamanship and pilotage. Also written *lode-merege.*

Lode-ship (*Eng.*). An old name for a pilot-boat. See LODEMANSHIP.

Lodesman. The Anglo-Saxon name for pilot.

Lodestar. See LOADSTAR.

Lodestone. See LOADSTONE.

Lodging-knee. See KNEE.

Lodia. A trading-boat of the White Sea.

Lofty Ship. An expression formerly applied to a square-rigged vessel.

Log. The apparatus used for obtaining the approximate rate of speed of a vessel through the water. It is first mentioned in the early part of the 16th century by Pigafetta, the companion of the celebrated navigator Magalhaens, who speaks of the log (*la catena a popa*) as a well-known means of measuring the course passed over. Purchas makes mention of it in 1607; but the length of a meridian not being then determined, its divisions were necessarily inaccurate. They were corrected in 1635 by Norwood.

The apparatus consists of the *log-chip*, *log-line*, *reel*, and 28 and 14 seconds *time-glasses.*

The log-chip is a flat piece of thin board in the form of a quadrant of a circle, of about 6 inches radius, loaded on the circular edge with lead, sufficient to make it float vertically. At the corners small holes are bored, and through the two near the extremities of the loaded arc are run the ends of a piece of small line about 4 feet long; these ends have a knot made in them so as to prevent their being drawn through when a strain is brought against the chip by the water. To the middle of this line is fastened a wooden plug, called a toggle.

The log-line is a small stout line, about 150 fathoms long, the end of which is taken through the remaining hole in the chip and knotted; at the same distance along the line, as the length of small cord from the face of the chip to the toggle, is fastened a piece of wood with a hole or socket into which the toggle fits. The whole is so arranged that when the toggle is in the socket the chip will hang in a three-legged span, and its surface be perpendicular to the log-line when straightened out, trailing in the water astern of a vessel. The toggle fits closely enough into the socket to require a sharp, quick pull on the line to free it, when the chip will trail point toward the ship, and can be easily hauled on board. The other end of the log-line is made fast to a reel about 2 feet long, which should turn with as little friction as possible, and is then wound up on it. The log-line is divided into distances, called *knots*, and these are subdivided into fifths, so that each subdivision will represent two-tenths of a knot. These divisions are all marked. The length of a knot is made the same part of a sea mile (6086.4 feet) that 28 seconds is of an hour, which gives for its length 47.4 feet.

To mark the log-line.—It should be first well soaked in water and stretched lightly, so as to take the kinks out, then measure off about 20 fathoms from the chip, and place a piece of white rag; this part is called the *stray-line*, and should be long enough to let the chip float well clear of the eddies, etc., astern of the vessel before the

marking of the knots commences; measure from the white rag the length of the first knot, and mark it by twisting into the line at that point a small piece of cord with one knot made in the end. Measure off the length of the next knot from this mark and mark it, with a piece of cord with two knots in the end, mark the next with three knots, and so on until all the line is marked. Then subdivide each knot into five equal parts, marking them with small pieces of fish-line, with no knots.

It is well on board ship to mark off on the deck the proper lengths of a knot and the subdivisions, and drive in copper tacks at these places. It will aid in marking a log-line, and will also be of use for future reference, as log-lines should be often examined and remarked. The stretch and shrinkage of the line varies very much under all circumstances.

The 28 and 14 seconds time-glasses consist each of two glass bulbs, joined by a small neck, placed in a metal or wooden frame for protection. One of the bulbs has an opening in the end through which is placed a quantity of clean, dry sand, the opening closed and covered, so as to keep out moisture, before the glasses are placed in their frames.

The quantity of sand in each glass should be such that it will take exactly 28 seconds of time in one and 14 seconds in the other to run through the neck into the lower bulb when the glass is held in a vertical position. These time-glasses need constant attention, and care should be taken to keep them dry, as moisture causes the sand to run more slowly, which would give incorrect results. They may be tested by means of a chronometer or watch, or a pendulum beating seconds, and be corrected if they are in error by adding or taking out a proper quantity of sand, or their error may be allowed for when known.

Logging the ship, or *heaving the log*, is the finding the speed of the vessel by means of the apparatus just described, and is performed thus: one or two men hold the reel, on the lee-side of a sailing vessel's stern or in a convenient place near the stern of a steamer, so that the line will have a clear run, another the time-glass, and the quartermaster, or a junior officer of the watch, adjusts the chip by putting the toggle into its socket on the log-line, so that it will not pull out too easily, then takes the chip and a small coil of line in his hand, and sees all clear. When he is ready he calls out to the glass-holder, "*Clear glass!*" to which the glass-holder, when the sand is all in one bulb, and he is ready, replies, "*All clear!*" The quartermaster then calls out, "*Look out!*" and throws the chip over the lee-quarter, so that it will float out clear, and take the line out straight in the wake of the vessel, and assists the line off the reel easily by small pulls, so as to overcome friction; as the white rag marking the stray-line passes the taffrail he cries out, "*Turn!*" which the glass-holder repeats, at the same time turning the glass so that the bulb with the sand in is uppermost, and the sand runs into the lower bulb, watching it closely. The instant the glass-holder sees the sand all out of the upper bulb he calls, "*Out!*" when the quartermaster grasps the line, checking it, and noting the last mark run out, or on the line at the taffrail; if there is no mark at the taffrail the nearest is noted, and the speed estimated from it. It is of no possible use though to try to estimate closer than one-tenth of a knot. A sharp pull on the log-line will easily free the chip, when the line is hauled on board and reeled up for the next heave. If, in the above case, the 28-second time-glass was used and, upon hauling in the line, three fish-line marks and then the 8-knot mark came in, the vessel's speed would be $8\frac{3}{5}$, or 8.6 knots. If using the 14-second time-glass, the speed shown by the line must be doubled to get the actual speed, and in the above case would be 17.2 knots. On board ship it is not customary to ask "How fast is she going?" but, "How much is she logging?" The answer in this case would be, "She is logging 8.6, or 17.2 knots." The 14-second time-glass is used when the speed of the vessel is above 6 knots, for the reason that the reel cannot be well handled with above about 10 knots line on it; it would be too heavy and bulky and take too long to heave, and also the line would be liable to break from its own weight in the water if more was used. It is customary, on board men-of-war under way, to heave the log at the end of every hour and note the vessel's speed, so as to calculate her run by the rules of navigation.

This method of determining a vessel's speed is at best but an approximation, requiring great care and skill to obtain any reliable result. A following sea will send the chip home and not give enough speed. A head sea will give too much. One person will give out the line to the chip too fast, another will not give it enough. In a sailing-vessel the wind may be squally, or increasing and decreasing, so that the speed will not by any means be the same through the hour. In such cases the log may be hove more frequently, and an average taken of the results as the speed for the hour.

A number of apparatus have been invented of late years for the same purpose, called patent logs, and taking their names from the inventors, one class of which are Massey's, Trobridge's, Reynolds's, Walkes's, etc. All of these are so nearly alike in principle and construction, that a description in general will suffice for all. They consist of an elongated metal box containing a system of cog-wheels connected with the hands of three dials showing on the outside. To the rear of the box is attached a hollow cylinder, on which is a small four-bladed propeller, whose spindle or shaft passes through this cylinder and connects with the cog-wheel work. The pitch of this propeller is known, and consequently the number of revolutions it will make in a mile, and the cog-wheel work simply registers these revolutions in distances passed over on the dials, one of which has the circumference representing 1 mile divided into tenths, the next the circumference representing 10 miles divided into tenths, each division representing 1 mile, and the last the circumference representing 300 miles divided into thirtieths, each division representing 10 miles, so that they will give readings from one-tenth of a mile up to 300 miles.

These logs are towed astern of the vessel at the end of a line from 35 to 60 fathoms long, so as to keep them clear of eddies and not allow them to be pulled out of the water by the vessel's pitching in a seaway, and have a swivel in the forward end to fasten the line to, so that it will not

twist up. From their shape they are sometimes called by sailors *harpoon-logs*.

When these logs are used the hands of all the dials are set at 0, the log then made fast to the towing-line and thrown overboard astern, and it is evident that the propeller will move faster or slower, corresponding to the speed of the vessel. This motion is communicated to the cog-wheels, and by them to the hands of the dials, by which means the distance run through the water in any given time is pointed out on the dials. The log is hauled in and the reading noted whenever the course is changed, and is also hauled in, read, and reset every 24 hours, generally at noon, to which time all the calculations of navigation are reduced on board vessels of the navy.

Under three knots the indications of these logs are not very accurate. They are liable to be stopped by sea-weed or anything floating astern, must be hauled in when the vessel stops or goes astern, and are liable to foul a steamer's propeller.

When the vessel is going slowly in shoal water and on rocky bottom they should be hauled in, as they are liable to catch on the bottom and be torn off. Sharks often bite them off. It must be recollected also that they do not give the distance the vessel has made good over the ground, unless she is running in no current. If she runs against the current, they will indicate the distance the vessel has made over the ground plus the distance the current makes over the ground in the same time, and in case of cross currents and stern currents, their indications would be a resultant of the speed of the vessel and the current.

Taffrail patent log.—In this log the principle is precisely the same as in the preceding ones, only the registering cog-wheel work, with its dials, is screwed upon a convenient place on the taffrail, and the propeller towed overboard from it by means of a long line, through which it communicates its motion to the register. The only way in which it is superior to those mentioned before is in its convenience to be read, doing away with the hauling in of the line each time, and only the propeller part is liable to be lost. The towing-line is liable to become full of kinks from the twisting motion. The register of this log has in cases been connected electrically to a self-registering apparatus in the cabin of the vessel, so that the distance run during the voyage could at any time be read off. A small bell was attached to the register, which would ring automatically at every mile passed. This is said to work well, but its expense has as yet prevented its general adoption.

The Clark-Russell, or *spring-log*, consists of a spring something like a grocer's spring-scale for weight, screwed upon the taffrail, to which a line and chip are attached. The pressures exerted upon a certain surface when it is towed through the water at different rates of speed are determined by experiment, and these different pressures in pounds form the scale to which the log is graduated. The chip is like the ordinary log-chip, and is towed from a line attached to a hook at the end of the spring by a loop, and whenever it is wished to ascertain the speed of the vessel the line is looped to the hook and the chip thrown overboard; the speed is then read off from the scale of the spring. The chip may be kept towing all the time, so that the speed of the vessel can be known at any instant; but this is not advisable, as it would in a short time weaken the spring, causing it to give incorrect results. Also, from constant use, the spring of this log loses its elasticity, yet it is considered very reliable. It, of course, does not give the distance run, but only the speed at the time it is used.

Current-log.—The log is often used to determine the direction and velocity of currents, and is then called a current-log. It is hove from a boat or ship at anchor, in the same manner as described for heaving it to determine a vessel's speed. The result given will be the number of knots and tenths the current runs per hour, and by taking the bearing of the chip by a compass the direction of the current is ascertained. In strong currents patent logs may be used.

Ground-log.—When surveying in shoal water and in currents, the actual run of the vessel over the ground is often wanted; to find this the log-line is made fast to a lead or small grapnel, which will hold it fast to the ground, and the speed is measured in a similar way to that before described, with the aid of the 28- or 14-second time-glass.—*J. E. Noël, Lieutenant-Commander U.S.N.*

Log or Log-book. The book which contains the official records of all transactions on board of a vessel, of voyages from port to port, and of meteorological observations made. The log-book of a ship of war contains in its columns the courses steered, distance sailed, and the leeway made for each hour at sea; the direction and force of the wind, state of weather, height of barometer, temperature of air and surface water, and a description of the clouds, whether in port or at sea, are also noted; the position of the ship at noon, by observation and dead-reckoning, the distance run and course made good, and the current by which the ship has been influenced are entered in their appropriate places. Under the head of "remarks" are entered an account of all official transactions, evolutions, drills, courts-martial, boards of inspection, signals with other vessels, punishments and offenses, ratings and disratings, names of all persons discharged, transferred, or received on board, accidents, such as grounding or collisions, and an account of all operations against the enemy, with the injuries sustained. All information of value to navigators, errors of charts, or peculiar appearances of the water are recorded. The log-book is signed by each watch-officer, who is responsible for the record kept during his own watch. It is examined daily by the navigator, who certifies as to its correctness, and is presented by him each day to the commanding officer for his approval. A copy of the log-book is sent every six months to the Bureau of Navigation at Washington.

Logged. Recorded in the log-book.

Log-glass. A time-glass measuring an interval of 14 or 28 seconds, used in connection with the log-line in ascertaining the speed of a vessel. See Log.

Log-line. See Log.

Log-slate. A double slate, the inner sides of which are marked in a similar manner to the two pages of the log-book, upon which each day's events are noted. The record upon the log-slate is copied daily into the log-book.

Logarithm. The exponent of the power to

which a given number, called a base, must be raised to produce a certain number. The logarithm of N is the value of x, which satisfies the equation of $a^x = N$, where a is the base. Since any positive number except unity may be taken as a base, there may be an infinite number of systems; but there are only two in use, viz., the Naperian, so named from Napier, a Scottish baron, who invented logarithms, and constructed the system in which the base is 2.71828, and the common system constructed by Henry Briggs, the base of which is 10. Every logarithm consists of an integer, or of an integer and a decimal number, the former being called the *characteristic* and the latter the *mantissa;* and of two factors, one depending on the base, and constant, and called the *modulus*, and the other upon the number, changing as the number changes. The Naperian logarithms are sometimes called *natural* logarithms, from the modulus of the system being unity; and sometimes *hyperbolic* logarithms, from their relation to certain areas included between the equilateral hyberbola and its assymptotes.

LOGARITHM, LOGISTIC. The logarithm of 3600 (number of seconds in an hour), diminished by the logarithm of the number of seconds in any period less than an hour, is called the *logistic* logarithm for that period. It is useful for interpolating for the moon's right ascension and declination.

LOGARITHMIC CURVE. A curve in which the subtangent is the same at every point.

LOGARITHMIC SPIRAL. A curve of which the tangent always makes the same angle with the radius rector.

Log-canoe. A canoe made from a single log.

Loggerhead. A small upright piece of timber in the stern of a whale-boat, over which a turn of the line is taken when it is running out too fast. An iron instrument used for heating tar. A species of turtle.

Logwood. The heart-wood of the *Hæmatoxylon Campeachianum*, a tree found in the tropical parts of the American continent. It is used as a dye.

Loich. An old English statute term, in which were included the cod-fish, ling, and lobbe.

Lomp. A kind of roundish fish.

Londage (*Eng.*). An obsolete term for landing from a boat.

London. The seat of government of the British empire and capital of England, is principally situated on the north bank of the Thames, in lat. (St. Paul's) 50° 30′ 49″ N., lon. 0° 5′ 48″ W. The area of the city is nearly 118 square miles; population 3,900,000, and it is the largest and richest city in the world. The docks of London have a river frontage of 4 miles, and an area of 566 acres. The two West India Docks cover 295 acres, one East India Dock 32 acres, South Dock 33, and St. Katharine's Docks 24 acres. The Thames is tidal up to Woolwich for ships of any burden. The tide ascends about 15 miles above London Bridge. The port extends to Gravesend, 30 miles down the river, and from Limehouse to London Bridge there is a continuous line of mercantile shipping. All kinds of manufactures are pursued here, the principal being those of silk, beer, spirits, type-founding, chemicals, engineering, and ship-building.

Londonderry, Ireland, is situated on the Foyle, 5 miles above Lough Foyle. The manufactories are mills for spinning flax, flour-mills, roperies, foundries, and ship-building yards. The principal exports are linen and linen yarn, eggs, butter, wheat, oats, and oatmeal, amounting annually to over $5,000,000. Regular communication by steamers is maintained with Liverpool, Glasgow, Greenock, and other ports. Ocean steamers call at Moville, on Lough Foyle, 18 miles below the town. Pop. 26,000.

London Wagon (*Eng.*). The name formerly given to the vessel by which impressed men were taken from London to the receiving-ship at the Nore.

Longa. A Roman row-boat of large capacity.

Long Ball. An old term for an engagement between vessels at long range.

Long Board. A long distance sailed upon one tack.

Long-boat. The largest boat which was formerly carried by merchant vessels. It was furnished with masts, sails, and oars, and was principally used in transporting stores, etc. In preparing for sea it was hoisted in and stowed on deck. It corresponds to the launch of a ship of war.

Long D-valve. An old English slide-valve, the cross-section of which resembled the letter D, having length sufficient to operate both steam-ports.

Longer (*Eng.*). Each row of casks placed in the hold athwartships.

Long Gasket. A sea-gasket or rope used at sea for securing a sail to its yard.

Longie (*Eng.*). The *Uria troile*, a sea-bird found on the northern coasts of America and Europe.

Longitude. The longitude of any point on the earth's surface may be defined as the angle at the pole contained between two meridians, one of which passes through the place in question, and the other through some conventional point regarded as the origin from which the longitudes are reckoned. From the first or prime meridian longitudes are reckoned east and west from 0° to 180° in arc, and from 0^h to 12^h in time.

The parallels of latitude being marked out by the paths followed by the stars in their apparent daily motion, the latitude of a point may always be determined by direct observation of the heavenly bodies, but in the case of longitude the element of time as measured by the daily revolution of the earth on its axis comes in, and the question resolves itself into the comparison of the local time with the time at the prime meridian.

Before the invention of the electric telegraph the transportation of chronometers regulated to the time of the prime meridian, and the motion of the moon, afforded the principal methods of measuring longitudes. By the first method most of the prominent points on the earth's surface have had their longitudes determined, but although great accuracy has been attained in the manufacture, chronometers are still subject to irregularities from changes of temperature and from induced magnetism of the steel parts, amounting to a considerable degree of error in long voyages.

The measurement of longitude by means of the moon's motion, although theoretically accu-

rate, is not so in practice for many reasons, among the principal of which is that the moon's apparent motion among the stars being only about one-thirtieth as rapid as that of the earth on its axis, any error of observation is multiplied in the resulting longitude by a factor nearly equal to thirty. As the inaccuracy of chronometric measurements increases with the distance between the points whose difference of longitude is to be established, geographers have urged the exact and permanent establishment of as many secondary meridians as practicable, situated at convenient distances around the earth, from which measurements could be quickly and accurately made to subsidiary points by chronometers. The very general connection of all important points by either land telegraph-lines or by submarine telegraph-cables at the present day, affords admirable facilities for the most simple and accurate method of determining longitudes, which is, in short, the comparison of the local times of two places by means of electrical signals.

The principle of this method, which in its present perfected state is due to American astronomers, is extremely simple. At each of the two places whose difference of time, and consequently of longitude, is to be determined a transit instrument, clock, and chronograph is established,—the chronograph being for the purpose of marking the exact time of any occurrence, such as the passage of a star over the wires of a telescope or the arrival of a time-signal. All preliminary arrangements being made, the error of each clock on the time of its place is determined by meridian transits of stars, and the clocks are compared the same evening by signals sent each way over the wire or telegraph-cable, thus, by comparison of the local times, determining the difference of longitude between the two places. The time occupied by a signal in traversing the wire or cable is quite appreciable, but is eliminated by sending an equal number of signals each way. The U. S. Hydrographic Office is now engaged in determining in this way as many secondary meridians as practicable all over the world. Although most maritime nations refer their longitudes to the meridian of Greenwich, the French still use that of Paris, which is 2° 20′ 14.5″ east of Greenwich, and the Spaniards that of Cadiz, which is 6° 12′ 20″ west of Greenwich. Although on some maps American geographers still show the meridian of Washington, it is practically used only as a secondary meridian, the Naval Observatory being 77° 3′ 5.8″ west of Greenwich, and all the longitudes of the United States being measured from it, or from the observatory at Cambridge, Mass., in longitude 71° 7′ 42.7″.—*F. M. Green, Lieutenant-Commander U.S.N.*

LONGITUDE BY ACCOUNT. The longitude deduced from the course and distance made from the last position determined by observation.

LONGITUDE BY CHRONOMETER. The longitude deduced by applying the hour-angle of a heavenly body, corrected for equation of time (or the mean time at the place of observation) to the mean time at a first meridian, which is shown by the chronometer. See LONGITUDE.

LONGITUDE BY A LUNAR OBSERVATION. A method of obtaining the longitude of a place at sea by measuring the angular distance of the moon from the sun, a planet, or fixed star. This method has gradually fallen into disuse since the great improvements that have been made in chronometers, as the liability to error is greater in a lunar observation than in other methods.

LONGITUDE IN ARC, and LONGITUDE IN TIME. The earth rotates uniformly on her axis once in 24 hours, and thus every spot on her surface describes a complete circle, or 360°, in that space of time. Hence the longitude of any place is proportional to the time the earth takes to revolve through the angle between the first meridian and the meridian of the place, and thus the longitude of a place may be expressed either in *arc* or in *time*. In reckoning by arc each degree is divided into 60 minutes, and each minute into 60 seconds. In reckoning by time, each hour is also divided into 60 minutes, and each minute into 60 seconds. But a distinct notation for each of these has been adopted, degrees, minutes, and seconds being represented by ° ′ ″, and hours, minutes, and seconds by ^{h} ^{m} ^{s}; and care should be observed not to use the same marks for both, great confusion arising from so doing. Longitude in arc and longitude in time are easily convertible, for since 360° is equivalent to 24^{h}, 15° is equivalent to 1^{h}, 1° to 4^{m}, and 1′ to 4^{s}.

LONGITUDE (CELESTIAL), CIRCLES OF. Great circles of the celestial sphere passing through the poles of the ecliptic, and so called because they severally mark out all points which have the same longitude.

LONGITUDE (TERRESTRIAL), CIRCLES OF. Great circles of the terrestrial sphere passing through the poles of the equator, and so called because they severally mark out all places which have the same longitude. They are also and generally called *meridians*, because for every place on the same circle it is noon simultaneously.

LONGITUDE OF A HEAVENLY BODY. The arc of the ecliptic intercepted between the first point of Aries and the secondary circle to the ecliptic, which passes through the place of the body. Or, which is the same thing, the angle at the pole of the ecliptic between the circle of longitude passing through the first point of Aries and that passing the place of the body. Longitude is reckoned from the first point of Aries eastwardly from 0 to 360°.

LONGITUDE, HELIOCENTRIC AND GEOCENTRIC. See LATITUDE.

Long-jawed. Said of a rope that has been used and strained until its lay has been lengthened.

Long-legged. Applied to a vessel of comparatively great length. Also to a vessel of great draft of water.

Long Oyster (*Eng.*). The cray-fish.

Long-service. Formerly said of a cable, served to protect it from chafe.

'Longshore-man. A dock-laborer or stevedore's man. Sometimes used by sailors as a term of contempt.

Long-shot. A shot at long range. The term is also used to express the error of another's statement.

Long Stroke. An order to a boat's crew to row with a greater length of stroke, and more outlay of strength.

Long-tackle. The name sometimes given to a top-burton, or the tackle by which a topsail is hoisted to the yard previous to bending.

Long Togs. Clothes worn by civilians.

Long Tom. A gun formerly used as a bow-chaser, which was of great length and range compared with the guns then in general use.

Long Voyage. One during which the ocean is crossed, as distinguished from a coasting voyage. Also called a *deep-water voyage.*

Long-winded Whistler. A long-range gun used as a chaser.

Loof, or Luff of the Bow. That part of the bow of a vessel where the planks begin to curve towards the stem.

Look-out. To watch. A person stationed to watch for land or vessels. A look-out is always stationed aloft, usually on the fore-topsail yard, from sunrise to sunset, and others, also, if the vessel is in the vicinity of dangers where extreme vigilance is required. From sunset to sunrise the look-out men are stationed, one on each bow and one at each gangway, and both by day and by night a man is stationed over the life-buoy at the stern.

Look Out for Squalls. Precautionary advice not confined to the weather.

Look Up. A vessel *looks up* towards her course as the changing of the wind allows her to sail nearer to that direction.

Loom. To appear enlarged, as a vessel or land seen indistinctly through fog. That part of an oar which, in rowing, is inside of the row-locks. A *loom-gale* is a moderate gale. The *loom of the land* is the darker appearance above the horizon (sometimes seen and often imagined), which indicates the proximity of land before it can be seen.

Loon. The bird *Colymbus glacialis*, or the "Great Northern Diver."

Loop. The bight of a small rope. The narrow part on the under side of a howitzer by which it is secured to its carriage. A *loop-bolt* is the bolt which passes through the loop of the howitzer and the lugs on the carriage to secure the piece in position. The *trail-wheel loop* is the aperture in the trail of a field-carriage into which the wheel enters, and the *loop-pin* holds the wheel in place.

Loose. To unfurl a sail; to let go a rope.

LOOSER. A man whose duty it is to loose a sail.

LOOSE FOR SEA. To get under way.

Loose Fall. A whaleman's expression for the loss of a good opportunity to strike a whale.

Loose Ice. Broken ice.

Loot. To plunder, and the proceeds thereof.

Loovered Batten. One of the sloping pieces of which blinds or open partitions are formed, by which air is admitted and rain excluded.

Lop-sided. Having one side larger than another. See LAP-SIDED.

Lorcha. A Chinese coasting-vessel, the hull being similar to vessels of European construction, while the rig is Chinese.

Lord Warden of the Cinque Ports (*Eng.*). The officer by whom the five ports of Hastings, Romney, Hythe, Dover, and Sandwick, and the additional ports of Winchelsea and Rye, are governed.

Lorient. A fortified seaport at the mouth of the Scorf, in the Bay of Biscay, department of Morbihan, France. The harbor is capacious, safe, and commodious, and lined by handsome quays. At some distance below the harbor its entrance is commanded by a fort on the Isle St. Michael, mounting 500 guns. The dock-yard and arsenal are among the most complete in France. The principal building is the Prefecture Maritime, situated at the entrance of the dock-yard. The city has also forges, foundries, and manufactures of steam-engines. Pop. 31,500.

Lorn (*Scotch*). The crested cormorant.

Lorrell (*Eng.*). A old term for a slow, lazy fellow.

Lose Ground. To fall to leeward.

Lose the Number of One's Mess. A common expression for dying.

Lose Way. To stop; said of a vessel when she loses her headway through the water.

Loss. A term in insurance denoting the damage to the insured subject by the perils insured against, in accordance with the terms of the contract. No loss can be within the meaning of the contract or policy except it be the direct result of one of the perils mentioned.

Lost. Said of a sunken or wrecked vessel.

Lost Day. The day that is lost in crossing the 180th degree of longitude from east to west. See DAY, CIRCUMNAVIGATOR'S.

Lost-motion. The motion due to loose journals and bad-fitting gear.

Lost or not Lost (*Eng.*). A legal clause inserted in marine insurance policies.

Lot. A contraction of "allotment."

Lotman. An old name for a pirate.

Lound (*Eng.*). Formerly signifying calm.

'Low and Aloft. An expression used when all sail is set.

Lowe (*Scotch*). A flame. The name applied to the torch used by fishermen at night.

Lower. A term characteristic of the principal division of a mast and the yard, rigging, etc., belonging to it. To ease away a tackle or any rope to which a weight is attached. To become cloudy.

LOWER-DECKER. One of the guns on a lower deck of a frigate or ship of the line.

LOWER HANDSOMELY. To lower away slowly.

LOWER-HOLD. The space under the lower deck in a merchant vessel having two decks.

LOWER-HOLD BEAM. A beam of the lower deck.

LOWER-HOPE (*Eng.*). One of the reaches in the river Thames.

LOWER LIFT. A lift belonging to the fore, main, or cross-jack yard.

LOWER-MAST. See MAST.

LOWER TRANSIT. The passage of a heavenly body across that part of a meridian which is below the horizon, or 180° from the upper transit.

Low Latitude. A latitude near the equator.

Low-pressure Engine. The terms *low* and *high pressure* were formerly synonymous with *condensing* and *non-condensing*, but at present a low-pressure engine is usually considered to be one the working pressure of which does not exceed 45 or 50 pounds per square inch.

Low Sail. A course or close-reefed topsail.

Low-water. Low-tide.

Low-water Alarm. A device arranged to blow a whistle when the water in a steam-boiler falls below a certain level.

Low-water Indicator. An attachment on a steam-boiler to indicate the water-level within.

Lowry, Reigart B., Commodore U.S.N. Born in South America, July 14, 1826. Appointed from Pennsylvania, January 21, 1840;

attached to sloop "Boston," East India Squadron, 1840–43; steamer "Princeton," special service, 1844–45; Naval School, 1846.

Promoted to passed midshipman, July 11, 1846; Home Squadron during Mexican war; present at Tampico, Tuspan, Vera Cruz, Tabasco, Seven Palms, and Alvarado; wounded slightly at Tuspan; razee "Independence," Mediterranean Squadron, 1850–52; sloop "Plymouth," East India Squadron, 1852–54.

Promoted to master, 1855.

Commissioned as lieutenant, September 14, 1855; steam-frigate "Powhatan," East India Squadron, 1855–56; receiving-ship, New York, 1857–58; sloop "Preble," Brazil Squadron, 1858–59; special duty, 1860–61; steam-sloop "Pawnee," Atlantic coast, 1861; was present in "Pawnee" in first firing on Fort Sumter; engagement at Acquia Creek, Potomac River, 1861; commanded steamer "Freeborn" in engagement at Matthias Point and other affairs on Potomac River; commanded steamer "Underwriter," in Albemarle Sound, 1861; was executive-officer of steam-sloop "Brooklyn" in the battles with the forts below New Orleans, and at the capture of the city; first attack on Vicksburg, June 30, 1862; commanded steamer "Scioto," Western Gulf Blockading Squadron, 1862–63; engagement at Donaldsonville, La., between "Scioto" and rebel force of 900 men and 7 pieces of artillery, October 5, 1862; engagement with batteries at Galveston, January, 1863.

Commissioned as lieutenant-commander, July 16, 1862; special duty, Washington, 1863–64; commanding apprentice-ship "Sabine," 1864–68.

Commissioned as commander, July 25, 1866; commanding flag-ship North Atlantic Fleet, 1869–70.

Commissioned as captain, November 2, 1871; commanding steam-sloop "Canandaigua," North Atlantic Station, 1872–74; Naval Station, New London, Conn., 1875–77; waiting orders, 1878–80. Commissioned as commodore, April 1, 1880.

Loxodromic. Pertaining to a vessel's course when it makes an oblique angle with the meridian. A *loxodromic curve* is a line drawn on the surface of the sphere which cuts all of the meridians at the same angle; a *rhumb-line*.

Lozenge. An equilateral figure having two acute and two obtuse angles.

Lubber. A clumsy, awkward person, lacking seamanlike qualities.

LUBBER-LAND. An imaginary condition or place referred to by seamen as the state of future existence of lubbers.

LUBBER'S HOLE. The space between a top and the mast-head which affords a passage into the top for greenhorns, or persons who are unable to climb outside of the top-rim.

LUBBER'S POINT. The black vertical line on the inside of the compass-bowl which represents the vessel's head in steering.

Lubricant. The oil or other substance applied to the bearings of a machine to diminish friction.

Lubricator. An oil-cup or other contrivance for supplying lubricants to the working parts of machinery.

Lucida. The brightest star of a constellation.

Lucifer. Son of Jupiter and Aurora, made the morning star. See VENUS.

Lucky Minie's Line (*Eng.*). The name given to the stem of the sea-plant *Churda filum.*

Luff. To bring a vessel's head nearer the wind. A name given to the forward leech of a fore-and-aft sail. That part of a vessel's bow where the planks begin to bend towards the stem. Also a familiar term for lieutenant. *To keep the luff* is to steer a vessel close to the wind. *Luff and lie* is an old expression, meaning to luff and remain close to the wind. *Luff and touch her* is to luff until the sails shake or *touch* slightly. *Luff into a berth* is to luff into a position for anchoring, bringing the wind ahead. *To luff round* is to luff into the wind as in tacking, or for the purpose of deadening the vessel's headway. *To luff hard* is to luff so as to shake the sails. A *luff tackle* is any tackle with a double and single block, which may be used as required. *Rigging luffs*, however, which are used for setting up lower rigging and stays, may consist of two double blocks or two single blocks. A *luff upon luff* is the purchase consisting of one luff-tackle applied to the fall of another.

Luff of the Bow. The roundest part of the bow.

Lug. A short flange or projection used to fasten one object to another. See LOCK-LUG.

Lug-boat. A boat carrying lug-sails.

Lugger. The name applied to vessels with two or three masts upon which lug-sails are carried. They are peculiar to the French and English coasts. During the early part of the present century they were frequently used as privateers and smugglers, and some vessels of this class were as large as 300 tons.

Lug-sail. A quadrilateral sail used in luggers, and frequently in sail-boats. It is bent to a yard, which is hoisted upon the mast by the halliards, which are attached to it at a quarter of the distance from the forward end. The tack of the sail is secured near the heel of the mast, and in hoisting the yard a strain is brought upon the luff of the sail, by which the yard is kept in an oblique position. It is inconvenient in use on account of the necessity of shifting the yard to leeward of the mast in tacking.

Lull. An interval of less force of wind during a gale.

Lull-bag. A wide hose made of canvas which is used on whale-ships for leading the blubber into casks.

Lumber. Timber sawed and split, ready for use. Articles heaped together in disorder.

Lump. The name of a heavy lighter used in English dock-yards for transporting anchors, cables, etc. *In the lump* is the whole together. *Lump sum*, a full payment in cash.

Lump-fish. A sea-fish of the genus *Cyclopterus* (*C. lumpus*). Its head and body are deep, thick, and short; the pectoral fins unite under the throat, and with the ventral fins form a single disk. It is soft, without scales, but covered with firm, horny spines. Called also *lump-sucker*.

Lumper. A dock-laborer. A person employed in loading or unloading vessels.

Lunar (*Lat. luna*, the moon). Pertaining to the moon. A short term for *lunar observation.*

LUNAR DAY. The interval between two transits of the moon over a meridian.

LUNAR DISTANCE. The moon having a very

rapid proper motion, her distance from other bodies which lie in her path varies very perceptibly in short intervals. Hence these distances have been made the foundation of one of the most important methods of determining the longitude at sea. In the Nautical Almanac are registered for certain dates the angular distance of the moon's centre from certain bodies as they would appear to an observer at the centre of the earth. When a lunar distance has been observed at any station on the surface of the earth, and reduced to the centre by clearing it of the effects of parallax and refraction, the Greenwich mean time corresponding to this true distance can be found from the tables by the method of interpolation.

Lunar Inequality. A variation in the moon's motion depending upon its distance from the sun.

Lunar Observation. A measurement of the angular distance of the moon from another heavenly body, with the altitudes of each, and the chronometer time of observation for computing the longitude.

Lunation. The *lunar month*, or, as astronomers call it, the *moon's synodical period.* It is determined by the recurrence of the moon's phases, and is reckoned from new moon to new moon,—*i.e.*, from leaving her conjunction with the sun to her return to conjunction. In consequence of the sun's proper motion in the heavens in the same direction with that of the moon, the latter body, after leaving the sun, will have more than a complete circle to perform in order to come up to the sun again. Hence a lunation exceeds the moon's sidereal period; its mean length is calculated to be $29^d\ 12^h\ 44^m\ 2.87^s$.

Lunisolar Precession. That part of the precessions of the equinoxes which is caused by the combined action of the sun and moon.

Lunisolar Year. The space of time at the end of which the eclipses occur in the same order. It is found by multiplying the cycle of the sun by that of the moon.

Lunitidal Interval. The interval between the moon's transit and the high-water next following. It varies from day to day during the fortnight between new and full and full and new moon. The lunitidal interval must not be confused with the *retard* or *age of the tide.*

Lunge. A thrust with a sword or boarding-pike.

Lupus. See Constellation.

Lynx. See Constellation.

Lyra (Lat. "The Lyre"). A constellation to the south of Draco and Cygnus. It contains one bright star *α Lyræ*, also called *Vega*, which may be known by its being situated at about the same distance from the pole-star on one side as Capella is on the other, and by its propinquity to the conspicuous pair of the Dragon.

M.

M. Of the letters used in the log-book to indicate the state of the weather, *m* denotes *mist.*

Maash. A large trading-vessel of the Nile.

Macao. A seaport town in China belonging to the Portuguese, on the island of Macao, at the southwest entrance of the Canton River, in lat. 22° 11′ N., lon. 113° 32′ E. The town is situated on a semicircular harbor, which is defended by forts north and west of the town. Large ships anchor in the roadstead east of the island, as the harbor will only admit vessels of light draft. The Portuguese obtained their footing in 1560, under pretext of erecting sheds for drying goods alleged to have been damaged in a storm. These sheds gradually gave way to substantial edifices, and finally to forts. The Chinese, however, held, until 1863, a lien upon the place, requiring of the Portuguese a rental of 500 taels, and retaining jurisdiction over their own people. After the rise of Hong Kong the commerce of Macao almost entirely disappeared; but its trade has been somewhat revived by making it a free port. Pop. 72,000.

Machias, Washington County, Me., is on the Machias River, about 10 miles from the Atlantic Ocean, and 70 miles E. by S. of Bangor. It is mainly supported by the coast trade, lumber business, and ship-building. It is also a port of entry. Pop. 2500.

Machine. An instrument of a lower grade than an *engine*, its motor being distinct from the operating part; it is of a higher grade than a *tool.* The word *machine* in its widest sense may be applied to every material substance and system, but it is generally restricted to works of human art.

Machinery. Machines collectively; the works of a machine, engine, or instrument so arranged and constructed as to apply and regulate force; as, the *machinery* of a watch.

Machine-guns. A machine-gun is a cannon in which the essential operations pertaining to continuous fire are automatically performed by machinery.

These operations are: 1. The supply of the cartridges and their insertion into the chamber and retention there during the discharge. 2. The storing up of the blow required for their detonation and the delivery of that blow. 3. The extraction of the fired cartridge-cases from the chamber and their ejection from the gun. 4. The direction of the gun in continuous firing.

The continuous operation of the parts required by the above definition should exclude from this class of guns those requiring or permitting simultaneous loading and discharge, and hence those in which the fire is consecutive but intermittent, like revolvers. The former class, often confounded with machine-guns, are properly *mitrailleurs*, or volley-guns, deriving their name

from the weapon of this character which first attained decided celebrity in France in 1870, and which in turn inherited its name from the cognate term long used to designate the simultaneous discharge from a single gun of a large number of small projectiles contained in a single envelope. Canister, grape, shrapnel, and even bird-shot are generically *mitraille*.

Among the mitrailleurs are included various parallel or slightly diverging systems of barrels arranged either side by side in a row, or, for economy of space and mutual support, grouped together in a bundle.

The former arrangement finds its prototype in the labor-saving device of the proof-master, crudely imitated in Flanders in 1347, where 4 breech-loading tubes of small calibre were mounted on a two-wheeled carriage, and by Fieschi, in 1835, in the infernal machine designed for the assassination of Louis Philippe. This was improved on by the American Requa, in 1861, who used breech-loading cartridges, thus permitting the barrels to be simultaneously loaded by mechanical means. A similar device was employed in the Franco-Prussian war, and is now known in Europe as the Abbatini.

This variety finds its last stage in the Nordenfeldt (Swedish) gun, which, while capable of simultaneous loading, admits of either simultaneous or consecutive fire. Its intervals are so short, however, that the intermittent character of its fire is hardly perceptible, and the gun may properly be classed either as a mitrailleur or a machine-gun.

The arrangement of the barrels in a bundle is so evident an advantage that it was naturally adopted at an early date. The barrels being stationary, are loaded by means of charging-blocks or plates pierced to correspond with the barrels, and serving to guide the cartridges simultaneously into their proper chambers from the rear. The motion of pressing the cartridges into place also serves in various evident ways to compress certain springs in the rear, which, on being released, either simultaneously or in succession fire the charge; or the cocking may be done independently.

Such are the French mitrailleur, the Taylor gun of about the same date, and others.

One evident objection to the forms of mitrailleur so far described is the recoil. When it is considered that some forms fire from 25 to 37 shots at once, it will be readily seen how the aim of the gun may be deranged and a constant correction required, which, aside from the heat of action, may be impossible from the smoke of the previous discharge.

Hence the development of the revolver principle, by which a cluster of barrels loaded at leisure could be fired in rapid succession. Once discharged, however, the time required to reload gives the fire an intermittent character, which takes it out of the class of machine-guns.

The origin of the revolver can be found as far back as the fifteenth century, when at an early stage of its career, the idea was improved on by diminishing the aggregate weight of the barrels by making them as short as possible, and bringing them successively opposite to a single tube of suitable length for aiming and for completing the combustion of the charge.

The axis of revolution is generally parallel to that of the barrel, but cases are not rare where it is at right angles, and either vertical or horizontal.

An example of the former kind is found in one of the earliest English patents for fire-arms, No. 418, A.D. 1718, granted to one Puckle. His "Portable Gun, or Machine called a Defense," contains, though crudely, some of the most recent improvements in the accessories of machine-guns, and is a close approximation to a weapon known as the "Union Repeating or Coffee-mill Gun," used in the war of the Rebellion. The latter, though, was properly a machine-gun.

Puckle's principal limitation seems to have been the "state of the arts" at the time of his invention; that fatal tether which has checked so many a self-reliant Icarus, and brought him back to earth to await the slow co-operation of the evolution he had forestalled.

Nowhere can the effects of such a bar be more plainly seen than in the tardy development of the ammunition intended for these guns; the most simple, evident, and essential feature of which, the gas-check, was so long unknown.

The invention and perfection of the self-primed, sheet-metal cartridge has been the main factor in the success of machine-guns,—not only for those qualities which have rendered possible the well-known development of portable fire-arms, but for the special necessity to machine-guns of the rigidity of construction and invariability of dimension which characterize the best ammunition of the present day.

The automatic nature of the mechanism in the gun, by which the continuous motion of the hand is transmuted into the complicated movements of the parts, by which so many conflicting operations are rapidly performed in so restricted a space, while possessing manifest advantages, deprives the operator of the benefits of a discriminating choice of the *material* with which his machine is supplied. Especially is this evident when one considers the exact time required to be kept in the relative motions of the parts, and the shock and strain to which all parts of this machine are subject at the discharge.

Hence the necessity for great regularity, both in the *food* and in the *feed*.

In the first place the cartridges must not only conform closely to each other when made, but must be so stiff and strong that their original dimensions will not be injured by transportation, by weather, or by time; and that when fired the least possible resistance will oppose the extraction of the empty cartridge-shell in all its parts, nothing being left behind to clog the machinery.

In the second place the form of the cartridges must be such and the special apparatus employed must be so arranged that the ammunition will be delivered to the machine so uniformly that its motion will continue unchecked, each cartridge falling into its appointed place exactly at its appointed time, thus enabling the gun to perform the functions of a true machine by delivering its product as long as its motion and its supply are maintained.

An individual soldier finding a cartridge too large or too small for his gun, or bursting in it, can readily discover the defect and may remedy it; but in a machine-gun, the works of which are concealed, and which, especially under excite-

ment, may be driven at their utmost speed, a slight defect may cause a jam which may be aggravated by misguided efforts for relief.

Hence the general deduction that the machine-gun depends principally on the perfection of its feed, and the feed upon that of the cartridge, or briefly, no cartridge, no feed; no feed, no gun.

The following are the principal machine-guns now extant:

I. Two or more stationary barrels parallel to each other in a horizontal plane.
   Gardner.—Two barrels.
   Nordenfeldt.—Five barrels.
   Taylor of 1878.*—Five barrels.

II. Rotary cluster of parallel barrels.
   a. Gatling.—Continuously rotating, and firing each barrel in each revolution while moving.
   b. Hotchkiss.—Periodically rotating, and firing each barrel in each revolution while at rest.
   c. Lowell.—Rotating at pleasure by hand for cooling and cleaning; firing consecutive shots through a single barrel at rest.

The following description is founded on the comparison of the different methods by which they perform the essential operations pertaining to a continuous fire.

Operation.—With one exception they are driven by the continuous motion of a crank, placed either on the side of the gun or directly in rear. The exception is the Nordenfeldt, in which a reciprocating motion is given to a horizontal hand-lever projecting to the right side.

The mechanical advantage of the former course is obvious, in that it avoids the resistance due to the inertia of the motor at each end of the stroke.

Feeding.—These guns are all fed from above by an arrangement of the cartridges side by side vertically; in one row for the rotary guns, and in as many rows as there are barrels for the other class.

The support for these cartridges is called a hopper, feed-case, feed-tube, or trough, according to circumstances. It may contain a weight supplied with a projecting thumb-piece, by which to accelerate the passage of the cartridges into the gun. In the Gatling the cross-section of the feed-case is continuous, save for a slit left for the movement of the thumb-piece up and down.

In the Nordenfeldt there is a compact group of such cases, but the weight, etc., are omitted. In the Gardner, Taylor, and Lowell guns the troughs are shallow and open in front, so as only to embrace the head of the cartridges. They can be readily filled by sliding into them with a scraping motion the heads of the cartridges as contained in the original packages. In these guns the troughs are vertical, opening to the front. In the Hotchkiss the cartridges roll into place successively down an inclined trough open on top.

All of these devices are sought to be arranged with reference to the rapidity of fire of the gun to which they are attached, so that the reserve contained in the hopper will not be exhausted before the next lot of cartridges can be supplied.

Loading.—The cartridges having been delivered from the hopper, are pushed into the barrel by a reciprocating piston in all the guns.

In the Gatling each barrel has its own piston revolving with it under the influence of the crank, but constrained to move obliquely to the axis in an elliptical orbit, by means of a corresponding stationary rib within the casing of the gun, but outside of the fluted cylinder which serves to guide the cartridges and pistons in their reciprocating path.

The action is thus progressive with each cartridge, but simultaneous for them all, giving an independent deliberation to each unit, but rapidity to the whole.

In the Hotchkiss, Lowell, Gardner, and Taylor guns the reciprocation of the piston is effected by various vertical cams actuated by the driving-crank. In the first two there is but one piston; in the last two there is one piston to each barrel, but its action is alternate.

In the Nordenfeldt gun each barrel has its piston, and they are moved together by the hand-lever.

Guiding.—The method of preventing the accumulation of cartridges in front of the piston, and of directing them into place, requires attention.

In the Lowell gun this is done by one or more deeply fluted "carrier rolls," revolving on an axis parallel to that of the gun, beneath the hopper and to one side of it. They take the nearest cartridge from the hopper in their flutes, guide it into its chamber, and receive its remains after the discharge.

The Gardner and Taylor guns require horizontally vibrating valves for this purpose, alternately cutting off and opening the mouth of the hopper.

In the Hotchkiss this is effected by a little trap-door, closing the mouth of the trough until the piston has receded from its insertion of the preceding cartridge into place, and has left the way clear for its successor to roll down into its front.

In the Gatling and Nordenfeldt guns this is accomplished by the proportion and arrangement of the contiguous parts.

Firing.—In almost every case the firing-pins are animated by spiral springs surrounding them, which are compressed against some projection during the forward motion of the piston in loading. The firing-pins being inclosed by the piston, are, so to speak, left behind until the moment has come for the blow.

In the Hotchkiss and Lowell guns the spring is compressed by a special cam on the driving-shaft. In both of these guns the firing takes place with the barrel at rest and in line with the axis, so as to avoid the deflection due to the recoil. With the Lowell gun, firing by simple pressure from the piston has been tried. In the Hotchkiss, the moment of rest during the firing is necessarily made use of for the loading and extraction.

Locking.—To support the cartridge against the discharge various similar devices are adopted, depending principally upon some flattening of the stationary or revolving cam by which the mechanism is actuated. This is extended somewhat to allow for a continued support after the moment intended for the explosion, in the chance of a cartridge missing fire. In the Hotchkiss, owing to the revolution of the cartridge away

* This is not the Taylor volley-gun of 1870, previously referred to.

from its loading-point, the recoil is borne directly upon the solid cast-iron breech-block.

Extraction.—The reciprocating motion of the piston readily suggests the spring-hooked extractor so commonly used in all bolt-guns.

In some cases it may work positively by contact with some projection serving to close its point in, but generally it depends upon its own elasticity for a hold. The hook is sometimes double.

Ejection.—The ejection is generally accomplished by the force of gravity alone, the cartridge falling on being swept off the hook of the extractor by a "plow," as in the Gatling, and dropping through a proper aperture to the ground.

The Gardner, Hotchkiss, and Taylor gun supplement this action by giving to the extracted cartridge-case a blow from an ejector to release it from the hooks. In the Lowell gun the extracted cartridge is drawn between the flutes of the carrier-rolls which guided it on its entrance to the chamber, and by their revolution is cast to the ground.

Direction of Fire.—The continuous fire of machine-guns, combining as they do in one weapon the force of many, requires an adequate distribution of their effect. Many ingenious devices have been invented to accomplish this result, but generally they are too complicated for this paper.

The horizontal dispersion seems likely to be generally effected by the simplest means, by slowly sweeping the gun in a horizontal plane during the act of firing, care being taken not to waste too many shots by unnecessary dwelling on the spot where the motion is reversed.

For this purpose the gun is generally mounted on a universal joint, moving independently of the carriage, and with its motion limited by suitable means.

For the vertical dispersion required in firing against torpedo-boats, and against objects requiring a rapid change of elevation, two especially ingenious devices have been adopted.

The Gatling has a lever projecting to the rear, and terminating either in a handle or in a crescent-shaped fork, supported at the gunner's waist by a strap passing over his shoulders. This handle is so arranged that at whatever elevation it may place the gun, simply relaxing the grasp of the hand sets it there, by releasing a binding wedge impelled forward by a spring.

The Hotchkiss has another arrangement better suited to the more deliberate nature of its fire. A crutch-like stock projects to the rear, to be drawn against the gunner's shoulder by the left hand, which grasps a convenient handle. Having thus complete control of the direction of the gun, his right hand can fire it at pleasure by an independent trigger, one assistant giving a continuous motion to the crank while another feeds.

Being thus able to follow by the splash of his bullets an attacking torpedo-boat, the gunner has an advantage at least equal to that of the Nordenfeldt mitrailleur, which is intended to deliver a searching volley as soon as the aim and elevation are found.

Ammunition.—The ammunition employed by these guns need only be limited in size, in any case, by the peculiar conditions of the gun. As a rule, on account of the unbounded supply of ammunition they require, they are intended to fire the ordinary infantry cartridge. But as this gives them no advantage in range over an opposing force of infantry, they are prone to increase their calibre and their range.

Rapidity.—The most rapid is the Gatling, which has been fired at the rate of 1000 shots per minute. The least rapid the Hotchkiss revolving cannon, which is timed for about 60 or 80 shots per minute. The rest vary, being at about the following rates: Gardner, 350; Lowell, 350; Nordenfeldt, 200–600. The Hotchkiss cannon makes up for its deliberation by firing a sensitive percussion-shell, which yields a large number of fragments on impact. Solid shot can also be used in it.

Great rapidity of fire cannot be long sustained, owing to the heating of the barrels which results. An ordinary breech-loading musket may easily be fired fast enough to blue the barrel and char the stock, so much more the machine-gun, which may fire 50 times as fast.

Adoption.—No one nation can be said to have exclusively adopted any one machine-gun.

England uses the Gatling on shore, and is said to prefer the Nordenfeldt afloat, in which respect she follows Norway and Sweden.

France, Brazil, and many other nations use the Hotchkiss cannon largely. The Gatling is under trial in Russia.

In the United States all of these guns but the Nordenfeldt are, or have recently been, under trial.

Conclusion.—Machine-guns are, generally speaking, auxiliary weapons for defense. In spite of their ingenuity and apparent advantages, they have not yet played a very important part in actual warfare.

References: Knight's Mechanical Dictionary, Encyclopædia Britannica, Appleton's Cyclopædia of Applied Mechanics, Cooke's Naval Ordnance and Gunnery, Reports of the Chief of Ordnance U.S.A., 1878–79–80, Ordnance Notes U.S.A., Report Group XVI. U. S. Centennial Commission.—*Henry Metcalfe, Captain U.S.A.*

Mackerel. A genus of fishes of the family *Scomberidæ.* It has a spindle-shaped body, the tail tapering greatly and being slightly ridged on each side. It is a beautiful fish of brilliant green and blue, the males having nearly straight dark transverse bands, the females having the bands elegantly undulated. It is generally 14 to 16 inches in length, and about 2 pounds in weight. It is readily caught with the hook and line, but the greatest quantities are taken in nets. They were formerly supposed to be migratory, but it is now believed that they merely leave the deep water and approach the coast for the purpose of spawning. The *Spanish mackerel* attains a weight of 4 or 5 pounds, and is more obscurely banded. The *mackerel-midge*, a very small fish, is a species of rockling, of the family *Gadidæ.* The scad is sometimes called the *horse-mackerel.*

MACKEREL-BOAT. A stout clinch-worked vessel, with a large foresail, sprit-sail, and jigger.

MACKEREL-BREEZE. A smart breeze,—favorable for fishing for mackerel with hook and line.

MACKEREL-SKY. See CLOUD.

MACKEREL-STURE. A name for the tunny, *Scomber thynnus.*

Macomb, William H., Commodore U.S.A.

Born in Detroit, Mich., June 16, 1818. Midshipman, April 10, 1834; lieutenant, February 27, 1847; commander, July 16, 1862; captain, July 15, 1866; commodore, July, 1870. In sloop "Portsmouth," East India Squadron, 1856–58; engaged and captured the Barrier Forts, Canton, China, November 16–22, 1856; commanded "Metacomet," Paraguay Expedition, 1859; steamer "Genesee," 1862–63; attempted the passage of Confederate batteries at Port Hudson, March 14, 1863, and was in frequent actions with Confederate batteries in April to June, 1863; commanded "Shamrock," North Atlantic Blockading Squadron, 1864–65; commanded naval force in capture of Plymouth, N. C., October 30, 1864, and in action with Confederates on the Roanoke River, near Poplar Point, N. C., and for his gallantry and energy in this service was advanced in grade; commanded steam-sloop "Plymouth," European Squadron, 1869; lighthouse inspector, 1871. Died, 1872.

Macrodactyl (Gr. *makros*, long; *dactylos*, a finger). A tribe of wading birds comprehending those in which the toes are remarkable for their extreme length, by means of which they walk upon the floating leaves of aquatic plants.

Macrometer (Gr. *makros*, long; *metron*, a measure). An instrument for measuring the distance of inaccessible objects by means of two reflectors.

Macropod (Gr. *makros*, long; *pous*, foot). One of a tribe of short-tailed decapodous crustaceans remarkable for the enormous length of their feet; the sea-spider, or spider-crab.

Macrourans (Gr. *makros*, long; *oura*, the tail). A section of decapod crustaceans, including all those which have the tail, or post abdomen as long as, or longer than, the body.

Mactra. A genus of lamellibranchiate mollusks, having a somewhat triangular shell. It is sometimes called *trough-shell*. The species are numerous and widely distributed. They burrow in the sand and mud of sea-shores and of the bottom of the sea. Their large, compressed foot enables them also to move with activity after the manner of cockles. The shells of some of the species are not lacking in beauty, while those of other species are coarse. Certain small species that abound on the coasts of Great Britain are gathered and fed to pigs. The fossil species are few.

Maculæ. Dark temporary spots which are very frequently observed upon the sun's disk; they are of various forms, surrounded by a lighter shade or penumbra.

Mad. The state of a compass-needle, the polarity of which has been impaired.

Maddy. A large species of mussel.

Made. Built up; composed of several pieces. A *made-block* is one in which the shell is composed of several pieces in contradistinction to a *mortised-block*, in which the shell is a single piece of wood. A *made-mast* is composed of several pieces hooped together, in contradistinction to a single-spar mast.

Madoc. A Welsh navigator whom his countrymen credit with having discovered America 300 years before Columbus sighted the island of San Salvador. He was the son of Owen Gwynnedd, a Welsh prince, and the tradition is that, being compelled by civil commotion to leave his native land in 1170, he sailed westward with a small fleet, and after a voyage of several weeks reached a strange country differing from Europe both in its inhabitants and its productions. After a considerable stay he returned to Wales and gave glowing accounts of the new land he had discovered. He got together another fleet and set sail again, but was never afterwards heard of. Southey has made the story of Madoc the subject of one of his "epics."

Madras, a maritime city of British India, in lat. 13° 4′ 6″ N., lon. 80° 14′ E., is situated on an open sandy shore, without a harbor or landing-place, and vessels are obliged to anchor in the roads in from 7 to 9 fathoms of water, exposed to the swell from the Bay of Bengal, which breaks upon the beach with great violence. The natives use catamarans as surf-boats, in which they venture out to ships in the heaviest weather. From October to January storms and typhoons prevail, and from the 15th of October till the 15th of December the anchorage is very unsafe. The first British settlement on this coast was at Armagon, 60 miles north of Madras, but the seat of the present fort being granted by a native prince in 1639, the nucleus of the city was formed. It soon became a flourishing place. In 1744 it was taken by the French, but was restored to the English in 1749. The roads and city are protected by Fort St. George, which is admirably situated for their defense. The imports consist of cotton goods, grain, spirits, metals, sugar, etc., and the exports of cotton, indigo, saltpetre, pepper, etc. Madras stucco, or chunam, is much used in the decoration of buildings, and also for paying the seams of ships. Pop. 398,000.

Madrier. The sheathing of a galley.

Maëstral. See MISTRAL.

Magalhaens. See MAGELLAN.

Magazine. A chamber in a gun containing a number of cartridges which are fed automatically to the piece. An apartment devoted exclusively to the storage of powder. Large vessels have two, one forward and the other aft. Magazines should be rectangular in form, and should be built strong to resist the working of the ship in heavy weather, and the pressure of water when flooded. As a protection against the fire of an enemy, the magazine should be as far as possible below the water-line. It should not touch the bottom nor the sides of the ship, but should be battened off to permit the bilge-water to run under it. The magazine and passage must be thoroughly calked, and lined with pine boards tongued and grooved, and over all, sheets of lead soldered together. There should also be an external lining of sheet-iron as a protection against fire and the intrusion of rats. All the metallic fixtures should be of copper, and magazine-dresses must always be worn by all persons entering the magazine. As a security against lightning, a magazine must be placed so as not to include a pump-well, mast, or anything connecting with the spar-deck. The alleys of a magazine run fore-and-aft, and there should be a communication between the two; each alley has a separate light-box. A sponge dipped in salt water, dried, and weighed, is used to detect dampness; if the sponge becomes heavier, the magazine is damp. Grating-hatches are fitted, to afford a supply of air to the men, and a ventilating apparatus is, also, generally furnished for this purpose. When-

ever the magazine is opened, every precaution is taken to guard against fire, the galley-fires and open lights being extinguished, and the magazine-scuttles screened off. The men are required to wear magazine-dresses, and no metallic article is introduced into the magazine. Coopering is prohibited in the magazine; when powder is received in barrels, the hoops are started on the berth-deck. See POWDER.

MAGAZINE-COCKS. Each magazine is fitted with a cock for flooding, and one at the bottom for emptying the magazine after having been flooded. There is also a waste-pipe at the top for carrying off the superfluous water when flooded. Both cocks should be so fitted that they may be turned from the deck above. The flood-cock should also have a lever in the passage accessible to the gunner in action.

MAGAZINE-DRESS. A worsted frock to reach to the knees; no metal buttons are worn. The shoes are made wholly of cotton canvas or buckskin; india-rubber and woolen slippers are prohibited.

MAGAZINE-PASSAGE. A small apartment cut off from the main body of the magazine, and communicating with it by means of small doors, which are only opened to permit ingress or egress. The cartridges are passed out through a small scuttle in the door, and thence to the deck above.

MAGAZINE-SCREEN. A screen made of thick fearnaught or double baize, so hung as to protect the scuttle of the magazine-passage from sparks or flame.

Magazine-gun. A portable fire-arm, containing a limited supply of cartridges, which are automatically fed into its chamber. (Adapted from Knight.)

The magazine-gun differs from the *machine-gun* chiefly by the added difficulty of the conditions regarding its portability and the convenience of handling it.

If the limited space afforded to the working parts of a field-piece, and the mobility required for its support, have been found important obstacles to the development of machine-guns, how much more heavily handicapped is the magazine-musket, which neither in weight nor in dimension can greatly exceed the single-barreled muzzle-loader of former times, but which must be capable of easy and certain working, by a single individual, in every operation pertaining to the machine-gun, in whatever position and at whatever speed it may be fired. Its only *point d'appui* also, in case of a mechanical mishap, being the yielding support of the left hand to oppose the unaided efforts of the right.

If the machine-gun had to suffer for the want of a good cartridge, so much the more therefore was the evolution of the magazine-gun delayed.

Before discussing the magazine-guns of the present day, which are all of recent origin, it may be well to examine some of the expedients resorted to in former times to obtain a consecutive fire.

Naturally the multiple-barrel, mounted on a single stock, was one of the earliest forms.

A curious example is found in a weapon ascribed to the Black Prince, son of Edward III. of England, date 1370. It consists of a sort of cylindrical iron mace on the end of a stout staff. It is belted by two cheerful rings of spikes, and is pierced so as to form four barrels, the means of discharging which have not been preserved. It rejoiced in the name of "Holy-Water Sprinkler," or "Blood-Spiller," depending, it is supposed, on the end from which it was seen.

Without reverting to other familiar forms of this type, such as the double-barrel, either side by side or superposed, and the revolver, the development of which has often been described, some account may be given of the efforts made to lighten the load imposed by this clumsy accumulation of independent barrels.

Single-barreled muzzle-loading guns have long been made to act as repeaters, the charges being superposed, and fire being communicated to them by a movable lock sliding along the outside of the barrel, or by a stationary lock, with different ducts for each charge.

The discharge has also been arranged to be consecutive by means of small openings through the bullets or alongside of them. Such was a "great brass hand-gun" described by Porta in his "Natural Magick," 1658.

This gun has recently been re-invented, and the two former types were exhibited in Philadelphia in 1876.

In all these cases the intention was to fire the top charge first, but of course the inflammation was often instantaneous, leading to a simultaneous discharge, with all of its disastrous results.

An exception to the general inutility of multi-barreled muzzle-loading fire-arms may be made in the case of the revolver, in the later forms of which the cylinder was, mechanically speaking, as regards completeness, rigidity of construction, certainty of feed and of fire, and the protection of its contents, *one* divisible cartridge.

At no time, however, was it safe from the chance of the simultaneous explosion of several of its charges, until, by the invention of the present cartridge, its safety could be assured without loss of its efficiency.

The Spencer was the first magazine-gun to attain decided celebrity, and in its prompt, complete, and satisfactory utilization of the state of the concurrent arts it still deserves our grateful distinction and regard.

It failed principally from the objection justly found to the superposed column of cartridges in the butt-stock. Although rim-primed, they were occasionally known to explode when jolted, as by the cavalry, to whose service the arm was otherwise so evidently adapted.

Apart from this objection which has been overcome in recent ammunition, the arm would have failed to meet our present need for a longer cartridge than could well be fed over its curved breech-block, and for a heavier charge of powder than could be safely loaded in the thin rim-primed shell, which was then considered essential to its use, and which was indeed almost the only shell in service.

The want of a proper cartridge caused the failure of this gun; but it was from actual experience in warfare with this weapon, even in its imperfect state, that the strongest arguments are derived by those who oppose the prevailing opinion that the use of repeating arms will result in a dangerous waste of ammunition in battle.

The statement has been made by a distinguished officer, that of two brigades of equal strength, equally engaged on the same side in the bloody battles around Richmond near the close of the war of the Rebellion, the brigade armed with the

Spencer was found, after several days' fighting, to have expended less ammunition than that which had the muzzle-loader.

Experience soon taught the soldier the value of the "pocket-pieces" he carried in the butt of his gun, and he reserved them until the need for their expenditure was dire.

The Henry magazine-rifle, originally known as the Volcanic repeating-rifle, and now as the Winchester, was the only other prominent magazine arm during the war of the Rebellion. It is used now in part by Turkey, while a close approximation to the Winchester—the Vetterli—is adopted by Switzerland and Italy.

An instructive example of the misguided efforts of inventors, who seek only by combination to improve, may be found in the Kirk and Rumsey modifications of the foregoing weapons. In one case there are 7 magazine tubes, and in the other 2 in the same gun. (Report Chief of Ordnance, 1873.)

General Requirements.—It follows from the automatic loading of magazine-guns that what is essentially a longitudinal sliding motion must be given to the part by which the breech is opened and closed; so that the cartridge once placed in line with the chamber shall be pushed directly into it.

Some cases occur in which the breech-block is hinged beneath the barrel as in the Spencer, but it is on so distant a centre that its motion is practically direct.

Hence the prevailing adoption of the sliding bolt as shown by Table I. hereafter, both on account of its simplicity in loading and for the readiness with which it lends itself to the subsequent operations with cartridges of any reasonable length.

For example, by a natural and continuous motion it is easily opened and closed, and locked or supported against the force of the discharge by turning one or more projections on it into corresponding notches in the frame in which it slides. Its motion also serves naturally either in opening or closing to compress a spiral spring surrounding an axial firing-pin, by which the cartridge may be fired; or else to cock an ordinary outside hammer in rear for the same purpose.

In the first of the former cases the spring is ordinarily compressed from the rear, between the bolt and a shoulder on the firing-pin, which rests against the sear. When the sear is pulled down out of the way by the trigger the blow will fall. Should the cartridge miss fire, as the cocking is dependent on the entire movement of the bolt, the bolt must be again withdrawn, which opens the gun unnecessarily. The extent of the compression which this method of cocking admits of permits the use of a long and elastic spring, which has certain mechanical advantages to offset the above defect.

In the second form the spring is compressed from the front, generally by the preliminary motion of loading in turning up the handle to open the piece. The independent operation of this form and of the class of outside locks relieves them from the disadvantages of the former combination.

The bolt-gun also offers the most ready form of extractor, the spring hook, which also lends itself so naturally to the ejection.

For almost any slight shock or resistance opposite to the extractor, across the face of the bolt, serves to flip the cartridge from its hold and send it spinning from the gun.

The direct action of the bolt, while offering these advantages, has certain defects which it has taken years of effort to overcome.

The most evident objection to the motion is the danger of an accidental explosion in closing, from the effect of the blow which some unusually sensitive cartridge may receive; particularly if its entrance into the chamber should be checked, or the point of the firing-pin should protrude.

This is met by three devices: 1. In all good bolt-guns the firing-pin is positively retracted within the block by the very motion of opening, and is kept back until the time comes for the piece to be fired. This is variously accomplished by contiguous spiral surfaces or cams, changing the rotary motion of the bolt in opening the gun into a longitudinal motion of the firing-pin. 2. In the act of closing, the face of the bolt strikes some spiral surface, along which it gradually advances as it is turned down into place, so as to relieve the cartridge itself of any shock, by screwing it, as it were, into its place.

3. The face of the bolt carrying the extractor is made loose upon its axis, so that in turning down it shall not grind the head of the cartridge either about the fulminate nor under the flange where the extractor bears.

This convenient transmutation of the rapid, direct, reciprocating motion of the bolt into a slow rotary motion is also made available for the first operation of extracting, as follows: The principal resistance offered by a cartridge to extraction lies in the start; if the backward pull is given too suddenly the extractor may break, or its hook may ride over the rim of the cartridge or cut through it; but if it is started slowly its subsequent withdrawal is an easy matter, owing to its conical form and that of the chamber in which it lies.

This has given rise to various plans by which the first rotary motion of opening is converted into a slow longitudinal motion, serving not only to start the cartridge, but also to half or full cock the piece, and retract the firing-pin as before described.

Sure extraction and ejection are even more important in magazine-guns than in the ordinary breech-loader, for if the spent shell be left in the chamber, or be not ejected in time, the succeeding cartridge may be driven against it with such force as to block and injure the gun.

So far have been considered the functions which the magazine-gun shares with the ordinary breech-loader, but in which, from the necessity of the case, much greater perfection of operation is required. There remains to consider the fundamental difference, which is the supply of the cartridges from the magazine to the part by which they are passed into the chamber, or the feed.

However this may be accomplished, it should have the following conditions and be free from the following defects, viz.:

1. It should be prompt, direct, automatic, sure, and continuous within the limits of the supply.

A failure in either of the last respects, if unobserved, exposes the firer to the confusion and other evil consequences of a misfire, on which his life may depend.

The cartridge should be guided into the chamber so that it may enter freely when driven forward by the breech-block.

The cartridge should be guarded against loss while in transit.

2. The feed should be regulated so that not more than one cartridge should escape from the magazine at once, otherwise the gun may be blocked, or cartridges may be lost.

This result is effected by various forms of automatic *magazine stops*. Being in a concealed position they should be strong, simple, and positive in their action. They should not depend upon invariability in the length of the cartridges employed, which will vary both in manufacture and from the jolting they receive in the magazine.

3. It should have a simple cut-off, by which the piece can be used as a single-loader, holding the magazine in reserve.

To prevent confusion this condition of the gun should be plainly indicated outside, and for safety so should the fact of its being cocked.

4. It should be capable of easy replenishing without unnecessary exposure of the working parts.

5. It should be adapted to the standard infantry ball-cartridge without loss of its accuracy and range, and with sufficient latitude to permit of the easy adaptation of the system to other special ammunition,—carbine, long-range, blank, etc.

6. It should be free from the risk of accident due to the inadvertent inversion of a cartridge in filling the magazine.

7. Taken together with the cartridge used, it should be free from the danger of an accidental explosion of the contents of the magazine or carrier, due to the escape of gas from defective cartridges.

8. The firing-pin or hammer should never fall before the block is securely and independently locked. Otherwise, even if no accident result, the effect will be the same as of a misfire.

Generally speaking, the construction of the piece should involve no difficulty in its poise, in working it, or in handling it as in drill or on the march. Its strength as a whole should be sufficient to resist ordinary accidents of transportation and service. The parts, besides being strong enough for their respective functions, should not depend upon too close fitting, or have too many "working points." A certain freedom of motion should be sought, not only on account of the resulting economy of manufacture and the avoidance of repairs, but to overcome the injurious effects of rust, dust, and dirt. The parts should be readily accessible without special tools, but should not be liable to be accidentally detached. Their motions should be positive, depending on their relative forms rather than on the use of springs or the force of gravity; and pins, rather than screws, should be preferred in their connections.

Finally, combination of the parts should be avoided rather than sought; each part should have as far as possible a distinct duty which it may be depended on to fulfill.

As will be seen by Table II., the position of the magazine has much to do with the performance of the gun.

As a rule, the cartridges are carried in a tube, experiments having shown that the perfected central fire cartridge may be less dangerous when so carried than the old rim-fire cartridge so long considered essential to a magazine arm. An escape from the apparent danger of the central-fire cartridge has been sought in various ways:

1. Making the point of the bullet flat or sunken.

2. Sinking the primer beneath the head of the cartridge, separately or in combination with 1.

3. Making the primer small in diameter, and not sensitive, depending for the certainty of its ignition upon a powerful lock, or a sharp firing-pin.

A single tube is generally used, though several tubes are sometimes assembled as a fluted cylinder, rotating, 1st, automatically, or, 2d, intermittently, at pleasure.

When a single tube is used it may be either above the barrel or beneath it, or in the butt-stock. The last is the better position, on account of the poise of the arm being less affected by the consumption of the cartridges in the magazine. It has, however, less capacity than the other form, the length of which is only limited by that of the barrel.

The clustered tube is generally found in the butt, replacing the "small" of the wooden stock, and its prolongation to the butt-plate.

To further protect the superposed cartridges, they are often kept apart by a long notched slide, or a fixed spiral surrounding a rotary fluted cluster. (Evans.)

To avoid all possible danger from this source, in one gun, Lee's, the cartridges are fed upwards side by side, through a mortise in the bottom of the groove in which the bolt works, and in front of the bolt when it is drawn back. This mortise interferes somewhat with the use of the gun as a single-loader.

The cartridges are generally expelled from the magazine by a spring, sometimes by the force of gravity, and sometimes, as in the Evans gun, positively by the operation of the parts.

They are sometimes, as with the Lee and Hotchkiss, delivered directly in front of the breech-block or bolt, but more frequently have to be transferred to a different level by a carrier; as in the Spencer, Winchester, Ward-Burton, etc.

In the report of the Board of Officers of which Gen. Alfred H. Terry was president, appointed in pursuance of the act of Congress, approved June 6, 1872, for the purpose of selecting a breech system for the muskets and carbines of the military service, may be found the following opinion on the value of magazine-arms:

"*Resolved*, That in the opinion of the board the adoption of magazine-guns for the military service by all nations is only a question of time; that whenever an arm shall be devised which shall be as effective as a single breech-loader, as the best of the existing single breech-loading arms, and at the same time shall possess a safe and easily manipulated magazine, every consideration of public policy will require its adoption."—May 5, 1873.

No magazine-gun was adopted thereafter by the United States until upon the report of a Board of Ordnance Officers convened in conformity with the act of Congress, approved November 21, 1877, to select a magazine-gun for the military service. The Hotchkiss gun was recommended September 23, 1878.

To the very full and interesting report of that board by Capt. John E. Greer, of the U. S. Ordnance Department, and to the report of the former

board by the writer, found in the reports of the Chief of Ordnance to the Secretary of War,—1873 and 1878,—the reader is referred for the details of almost all prominent magazine-guns now extant. See also Lieut. T. B. M. Mason's (U.S.N.) translation of Report of French Naval Board, New York, 1879.

The following tables are taken from Capt. Greer's report, as giving in the most condensed form the information generally desired:

Table I.

** Classification of magazine-guns founded on the motions of the principal part by which the breech is opened and closed.*

Breech-loading small-arms have—	fixed chambers closed by—	movable breech-blocks which are—	1st, sliding—	in line of axis of barrel by—	1st, direct action, *i.e.*, bolt-guns having—	1st, concealed locks		Hotchkiss. Remington. Burton. Ward-Burton. Franklin. Lee. Sharps Rifle Company. Kropatschek (*Fr. navy*).
						2d, centre locks		Hunt.
					2d, indirect action, *i.e.*, moved by levers from—	below		Winchester. Burgess. Tiesing.
			2d, sliding and rotating					Buffington. Chaffee.
			3d, rotating about an axis—	at 90° to axis of barrel, and—	horizontal, lying—	1st, above axis of barrel, and in—	front	Springfield-Miller. Springfield-Clemmons.
						2d, below axis of barrel, and in—	front, moved from— below (by a lever)	Lewis-Rice.

Table II.

Classification of magazine-arms founded on the method by which cartridges are fed from the magazine.

Magazine-arms.	supply chamber with cartridges from—	1st, butt-stock	1st, by a spring	1st, direct			Hotchkiss. Lewis-Rice. Spencer.
				2d, indirect	1st, by rotating barrel about axis parallel to it into line with magazine.		Scott and Triplet.
					2d, to position opposite receiver		Clemmons.
			2d, by a ratchet, which is—	1st, automatic			Chaffee.
				2d, operated by hand.			Springfield-Miller.
			3d, by a spiral cam (screw motion)				Evans.
		2d, tip-stock	by a spring—	on a carrier which is—	1st, sliding, at right angles to axis of bore		Winchester. Henry. Hunt. Vetterli.
					2d, rotating—	1st, to position oblique to axis of bore	Burton. Ward-Burton. Sharps. Remington. } Kropatschek.
						2d, to position parallel with axis	Tiesing. Burgess.
					3d, sliding and rotating—		Buffington.
		3d, magazine on top of barrel	by a spring—	to position parallel to axis of bore and above receiver—	and by gravity into line with axis of bore.		Franklin.
		4th, magazine below bolt	by a spring (vertically)—	to position opposite centre of chamber.			Lee.
		5th, revolving chambers.					Hodges. Colt's repeating-rifle. Revolving pistols.

* Classification similar to that given in Ordnance Memorandum No. 15.

Table III.—Abridgment.

*Showing the performance of the four principal magazine-guns before the board under the following rules marked *.*

Name of Gun.	No. of Cartridges carried.	Weights.		Rapidity of Fire.																	
				With Accuracy—Shots in 2 minutes.								At Will in 1 Minute.				Time of Firing 20 Shots with Aim.		Time of Firing 6 Shots—in Seconds.			
				As a Magazine-gun.				As a Single-loader.				As a Magazine-gun.		As a Single-loader.				From the Shoulder.			At Will.
																		Hotchkiss.		U.S. Springfield.	Hotchkiss. Magazine.
		Not loaded. lbs. oz.	Fully loaded. lbs. oz.	Shots.	Hits.	Misfires.	Left in Magazine.	Shots.	Hits.	Misfires.	Left in Chamber.	Shots.	Left in Magazine.	Shots.	Left in Chamber.	Seconds.	Hits.	As a Magazine-gun.	As a Single-loader.		
Hotchkiss.....	6	9.0	9.8	29	20	...	5	44	26	...	...	22	1	28	...	97	43	8	16	18	6
Winchester..	11	10.6½	11.6	35	22	...	8	30	24	...	...	28	2	23	1	118	48				
Remington...	9	9.9	10.6	34	20	2	2	44	17	1	...	10	8	24	1	149	47				
Sharps.........	11	10.0	10.15¾	27	24	...	6	41	33	1	...	21	4	26	...	154	38				

Tests to which the above guns were subjected.

REGULAR TESTS.

Safety test: To be fired 10 *rounds by the exhibitor or with a laniard.*

The piece to be first fired 10 rounds by the exhibitor, as a test of safety; the same firing to be also a test of rapidity by one familiar with the arm. The time to be noted in the record.

The firing to be then continued according to the rules annexed, by an employé of the armory, or soldier detailed by the War Department.

The service-cartridge to be used in all cases.

I.—Rapidity with Accuracy.*

The number of shots which, fired in two minutes from the gun,—both as a magazine-gun and as a single-shooter,—strike a target 6 feet by 2 feet at a distance of 100 feet. Any cartridges missing fire in this or other tests to be tried with a prick-punch, or opened to ascertain the cause of failure. The test to be begun with the chamber or magazine filled; other cartridges to be disposed at will on a table.

II.—Rapidity at Will.*

The number of shots which can be fired in one minute, irrespective of aim, under the same circumstances as in Test I.

III.—Endurance.

Each gun to be fired 500 continuous rounds without cleaning, using the magazine. The state of the breech mechanism to be examined at the end of every 50 rounds.

IV.—Defective Cartridges.

Each gun to be fired once with each of the following defective cartridges: 1. Crossed-filed on head to nearly the thickness of the metal. 2. Cut at intervals around the rim. 3. With a longitudinal cut the whole length of the cartridge, from the rim up. A fresh piece of white paper, marked with the number of the gun, being laid over the breech to observe the escape of gas, if any occur.

V.—Dust.

The piece to be exposed in the box prepared for that purpose to a blast of fine sand-dust for two minutes; to be removed, fired 20 rounds, replaced for two minutes, removed and fired 20 rounds more.

VI.—Rust.

The breech mechanism and receiver to be cleansed of grease, and the chamber of the barrel greased and plugged, the butt of the gun to be inserted to the height of the chamber in a solution of sal-ammoniac for ten minutes, exposed for two days to the open air standing in a rack, and then fired 20 rounds.

VII.—Excessive Charges.

To be fired once with 85 grains of powder and one ball of 405 grains of lead; once with 90 grains and one ball, and once with 90 grains and two balls. The piece to be closely examined after each discharge.

SUPPLEMENTARY TESTS.

1st. To be fired with two defective cartridges, Nos. 1 and 2, and then to be dusted five minutes, the mechanism being in the mouth of the blow-pipe, and closed, the hammer being at half-cock; then to be fired 6 shots, the last two defective Nos. 1 and 2; then, without cleaning, to be dusted with the breech opened, and fired 4 shots. The piece to be freed from dust only by pounding or wiping with the bare hand.

2d. To be rusted for four days after immersion as before, and then fired 5 rounds with the service-cartridge; then, without cleaning, to be fired 5 rounds with 120 grains powder and a ball weighing 1200 grains; the gun to stand twenty-four hours after firing without cleaning, and then to be thoroughly examined.

Provided, "That all arms selected for supplementary tests be rusted simultaneously, *i.e.*, that they be immersed at the same time, for ten minutes, in the same sal-ammoniac solution, and afterward exposed side by side to its corroding action for four days, when they will each be fired 5 rounds with service-cartridges; then, without cleaning, fired 5 rounds with 20 grains of powder and a ball weighing 1200 grains; after this, each gun to stand twenty-four hours without cleaning, and then to be thoroughly examined."

* 3d. Facility of manipulation by members of the board.

"That to determine the comparative rapidity of fire and facility of manipulation, as contemplated by the third supplementary test, each gun be fired 20 shots by three enlisted men of the armory detachment, loading from the cartridge-box and firing with aim at a target 6′ by 24′ 100 yards distant. The average of the three trials to be the recorded time of firing 20 rounds. The magazine to be loaded from the cartridge-box before the start, the remainder of the cartridges to be fired away first, using the gun as a single-shooter, and the magazine to be emptied last."

Aside from the magazine-guns proper, which depend on an automatic feed, many devices called

detachable magazines have been invented, some of them attached to the person of the firer, as well as to the gun. (See report above, 1873; also Lieut. Greene's Report on Russo-Turkish War, 1878.)

These devices occupy an intermediate place between the single breech-loader and the perfected magazine-gun, but owing to the rapid development of the latter arm have not been received with favor.

As with machine-guns, but owing to the success of the Spencer, in a less degree, magazine-guns have yet to win their spurs by actual conflict in battle with single breech-loaders of good quality in the hands of equally good troops.

Speculation as to their future is useless, except as far as it shows the general drift of public opinion in their direction. It is safe to say that they will not be generally adopted until the development of many other questions affecting the supply of their ammunition has been greatly advanced.—*Henry Metcalfe, Captain U. S. Army.*

Magellan, or Magalhaens, Fernando de. A famous Portuguese navigator, born about 1470; died April 27, 1521. He served under Albuquerque in the East Indies, and especially distinguished himself at the taking of Malacca, in 1511. He afterwards entered the Spanish service, and was intrusted by Charles V. with the command of a fleet destined to explore a passage to the Molucca Islands by sailing westward. The voyage was begun September 20, 1519. About the end of October, 1520, he entered the strait since called after him, and November 27, discovered and named the Pacific Ocean. Continuing his course, he arrived at the Ladrone Islands about March 6, 1521, and subsequently at the Philippines, on one of which he lost his life in a skirmish with the natives, or, as some accounts state, by the mutiny of his crew. One of his ships, with 18 men, escaped, and reached Seville, September 8, 1552, under Sebastian del Cano, who first circumnavigated the globe. An Italian named Pigafetta, who accompanied Magellan, kept a journal of this last voyage, which was published.

Magellanic Clouds. Nebulous patches near the south pole of the heavens. Early voyagers called them the "Cape Clouds," afterward they were named for Magellan. They contain a great number of single stars from the fifth to the eleventh magnitude; many star-clusters, irregular, oval, and globular; and nebulæ. The large cloud occupies a space of 40 square degrees; the small one is only one-fourth as large.

Magellan Jacket. A name given to a watch-coat with a hood, worn in high latitudes, —first used by Cook's people.

Magged. Worn, fretted, and stretched; as, a magged brace.

Magnet. A substance which has the property of attracting iron and some of its ores, and which, when suspended freely, adjusts itself in the plane of the meridian. A *natural magnet* is known by various names in different parts of the world. Pliny called it *ferrum vivum;* the Chinese call it *tchu-chy*, the directing stone; in Swedish it is *segel-sten*, the seeing stone; in Icelandic, *leiderstein*, the leading stone; and in English, *loadstone* or *lodestone* (Sax. *læden*, to lead).

An artificial magnet is one to which polarity has been communicated by artificial means. When a bar remains long in the magnetic meridian its particles acquire the magnetic polarity. On board ship the iron-work often becomes magnetized and affects the local deviation of the compass. Spare compass-cards should be stowed with the north pole of one to the south pole of the other. According to their forms artificial magnets are called *bar-magnets*, *horse-shoe magnets*, *compound magnets*, etc.

Magnetic Axis. The direction of the magnetic polarization of a needle.

Magnetic Equator. A line encircling the earth, on every point of which the dipping-needle remains horizontal,—the line of no dip. It crosses the terrestrial equator in several places, never receding from it more than 12°; the positions of the two nearly coincide in the part of the Pacific where there are no islands, and diverge most when crossing large bodies of land, as Africa and South America.

Magnetic Meridian. The direction which a magnet assumes when suspended freely, and not subject to local attraction or disturbing influences.

Magnetic Needle. A slender bar or plate of magnetized steel.

Magnetic Poles. Two spots, or rather short lines, on the earth's surface where the dipping-needle assumes a position perpendicular to the horizon. See Compass, The Mariner's.

Magnitude of Stars. Astronomers have distinguished the fixed stars according to apparent brightness. The brightest stars, of which there are about 20, are of the first magnitude; stars of second magnitude number about 50; of third magnitude, 200, and so on, the numbers increasing rapidly in the lower classes. The seventh magnitude includes the smallest stars visible to the naked eye. The stars of less than the seventh magnitude are known as *telescopic* stars. The divisions between the magnitudes are not clearly defined, being arbitrary and conventional.

Magnus-hitch. A round turn around a spar, the turn being jammed by a half-hitch around the spar on the opposite side of the standing part.

Magootee. A musical instrument used by the snake-charmers of the East Indies. In it is a mirror, on which the snakes fix their eyes in dancing.

Mahone, Mahonna, or Maon. A Turkish flat-bottomed vessel of burden, mentioned among the ships of Soliman Pasha in the siege of Diu.

Maid. A name of the skate.

Maiden. A fortress which has never been taken.

Maigre. A fish of the family *Sciænidæ*, common in the Mediterranean. It is from 3 to 6 feet long, and so strong that a stroke of its tail will throw a man down. It is one of those fishes which emit a purring or buzzing sound, and has been heard from a depth of 120 feet. It is the *umbrina* of the Romans. The stones of its ears were formerly set in gold and worn around the neck, imaginary virtues being ascribed to them, particularly in the cure of colic; but it was requisite that they should be obtained as a gift, and not by purchase.

Mail-shell. A name for the chiton.

Mailed Cheeks. A family of acanthopterous fishes characterized by an extension of certain sub-orbital bones to the gill-covers to form a bony

armor for the cheeks. To this family belong the gurnards, bull-heads, and sticklebacks.

Main. A continent or mainland. The great sea as distinguished from an arm. The chief part of anything. The distinguishing characteristic of all those articles belonging to, or connected with, the principal mast in a vessel.

MAIN-BOOM. The boom that extends the foot of a boom-mainsail.

MAIN-BRACE The brace attached to the main-yard. (See BRACE.) *Splicing the main-brace*, a figurative expression for drinking spirits.

MAIN-CENTRE. In side-lever engines it is the shaft on which the levers vibrate; in general it is the centre of the heaviest revolving part.

MAIN CHECK-VALVE. An automatic valve connecting the feed-pipe to the boiler, to prevent the water running out of the boiler in case the feed-pipe bursts, etc.

MAIN-COURSE. A square mainsail.

MAIN-DECK. A gun-deck next below the spar-deck.

MAIN-HATCH. The hatch just forward of the mainmast.

MAIN-HOLD. The division of the hold in the vicinity of the main-hatch.

MAIN-LINK. One of the pieces in the parallel motion of a beam-engine, connecting the piston-rod to the beam; the piece connecting the backing and go-ahead eccentric-rods of a steam-engine for reversing motion.

MAINMAST. The principal mast,—the second from the bow. For the rigging of the mainmast, see under proper heads.

MAIN MAST-MAN. A man stationed to attend to the gear of the mainmast. See MAST-MAN.

MAIN-PIECE. The principal piece of the head.

MAIN-ROYAL. See ROYAL.

MAINSAIL. The sail bent to the main-yard. The principal sail of a fore-and-after. For the rigging of the mainsail, see under proper heads.

MAINSAIL HAUL! The order to swing the after yards in tacking.

MAIN-STAY-SAIL. A sail set on the mainstay; it is used only in bad weather, and is generally called the *main storm-stay-sail.*

MAIN STAY-TACKLE. See TRIATIC STAY.

MAIN STORM-STAY-SAIL. See MAIN-STAY-SAIL.

MAIN-TOP. See TOP.

MAIN TOP-BOWLINE. *As long as the main top-bowline*, a sailor's simile for anything of absurd length.

MAIN-TOPGALLANT. See TOPGALLANT.

MAIN-TOPMAST. SEE TOPMAST.

MAIN-TOPSAIL. See TOPSAIL.

MAIN-TOPSAIL HAUL! The order to swing the after yards, in tacking, when the mainsail is not set.

MAIN-TRYSAIL. See TRYSAIL.

MAIN-WALES. An assemblage of planks placed upon the widest part of the body.

MAIN-YARD. The lower yard across the mainmast. For the rigging of the main-yard, see under proper heads.

MAIN-YARDMAN. A man stationed to loose, furl, reef, etc., the mainsail and rig the purchases for swaying up or striking the main-yard,—generally a quartermaster, quarter-gunner, or afterguardsman. The term is also applied to a man on the sick-list.

Make. *To make bad weather*, to roll and pitch violently in a moderate sea,—generally caused by injudicious stowage or negligent steering. *To make fast*, to belay a rope. *To make free with the land*, to approach closely the shore. *Make it so!* the order of the commanding officer to strike the bell when 8 A.M., 12 M., or 8 P.M. is reported. *To make sail*, to clap on additional canvas. *To make the land*, to sight it from a distance coming from seaward. *To make water*, to leak. A ship makes *foul water* when the water is so shallow that her keel stirs up the mud. *To make off*, to cut into pieces the blubber of a whale.

Malafiges. A sailor's name for the goylir, a small sea-bird supposed to precede a storm.

Malaga is situated on a bay of the Mediterranean, in the southern part of Spain, in lat. 36° 43′ 5″ N., lon. 4° 26′ E. The principal manufactures are linen, woolen, and cotton fabrics, sail-cloth, rope, paper, hats, leather, and soap. The harbor is capable of holding a large number of ships, and can be entered during any wind. The exports consist of wines, olive oil, figs, almonds, raisins, grapes, lead, iron, etc. Pop. 95,000.

Malapterurus. A genus of small malacopterygious fishes, possessing a high degree of electrical power (*Malapterurus electricus*). *M. electricus* is found in the Nile.

Malduck. One of the names given to the fulmar, *Procellaria glacialis.*

Male-thread. The thread of a bolt,—that of the nut, or internal thread, being called a female-thread.

Malingerer. One who counterfeits illness for the purpose of avoiding duty.

Mallemak, or Mollymauk. A sea-bird; the *Procellaria glacialis*, called also *fulmar.*

Mallemaroking. The visiting and carousing of seamen in the Greenland ships.

Mallet. A hammer-shaped wooden implement. A *calking-mallet* is used to drive oakum into the seams; its head is long, cylindrical, and hooped with iron. A *serving-mallet* is used as a lever in putting on service, wrapping it more tightly than could be done by hand

Mallotus. A genus of small fishes found along the coast of Greenland; the capelan.

Malström. The most famous whirlpool in the world, off the Norwegian coast, between two of the Loffoden Isles. The current runs 6 hours in one direction and then 6 hours in the opposite way, producing violent whirls. The depth of water is about 20 fathoms, while immediately to the west it is over 100 fathoms. The whirlpool is most violent at the turn of the tide, and if at this time the wind blows against the current the sea becomes extremely dangerous. The stories of ships, whales, etc., being swallowed up in the vortex are mere fables, but there is no doubt that a ship would be in danger of being dashed upon the rocks, and whales have been found stranded on the coast of Flagstadt from the same cause.

Malta. An island in the Mediterranean whose central position makes it important as a commercial depot and of great value as a naval station. It belongs to Great Britain, and is situated 62 miles S.S.W. of Sicily, and 197 miles N. of Africa. Lat. 35° 53′ 48″ N.; lon. 14° 31′ 15″ E. On all sides except the south its coast-line is deeply indented. Its largest bays are those of Mursa and Sirocco on the S.W., and Melleha

and St. Paul's on the N.E.; but the most important in every respect is the double bay formed by the opposite sides of the remarkable peninsula on which the capital, Valetta, stands. Malta is strongly fortified, and is provided with excellent docks. Pop. 150,000.

Maltha. Mineral pitch.

Man. To furnish with a complement of men; as, to man a boat, to man a rope, etc. One of the ship's complement, be he seaman, boy, or marine.

MAN-BOUND. Detained in port in consequence of being short-handed.

MAN-BROKER. A boarding-house master.

MAN-HANDLE. To move by the force of men without the assistance of levers or purchases of any kind.

MAN-HOLE. A hole in a boiler, tank, etc., designed for the entrance of a man, for examination, cleaning, repairs, etc.; it is closed by a piece called a man-hole plate.

MAN-OF-WAR. A national vessel.

MAN-OF-WAR BIRD. See FRIGATE-BIRD.

MAN-OF-WAR FASHION. A neat, orderly, seamanlike manner.

MAN-OF-WAR'S MAN. One of the crew of a man-of-war, as distinguished from a sailor in the merchant marine.

MAN OVERBOARD! The alarm when a person has fallen overboard. See EMERGENCIES AT SEA.

MAN-ROPE. A rope at each side of a ladder as an assistance in getting up and down.

MAN-ROPE KNOT. A knot in the upper end of a man-rope; it is double walled and double crowned.

MAN-TRAP. An open hatch, an insecure ladder, or anything left unguarded and therefore likely to cause an accident to a man.

Manametor. An instrument for measuring the elastic force of gases. A pressure-gauge.

Manarvel. To pilfer small stores.

Manatee, Manati, or Sea-cow (*Manatus Americanus*). A herbivorous aquatic animal of the order *Sirenia*, found in the West Indies and South American rivers. Another species (*Manatus Senegalensis*) inhabits the west coast of Africa.

Manatidæ. A family of *Cetacea*, including all the herbivorous section of the order. They differ from the ordinary *Cetacea* in having swimming-paws rather than pectoral fins. It is supposed that many of the stories of mermaids originated in some of the females being seen with their head and breasts raised out of water.

Manche, or Mangalore. A flat-bottomed boat of burden, about 25 to 35 feet long, 6 or 7 feet broad, and 4 or 5 feet deep, for landing the cargoes of the *patamirs*, which are discharged and loaded at the mouth of the river. These boats are sewed together like the Masulah boats of the Madras. The *Manche of Calicut* is very similar to the foregoing, with the exception of a raking stem for the purpose of taking the beach.

Manchineel. *Hippomane mancinella*, a tree which grows to a vast size on the coasts of the Caribbee Isles, and neighboring continent. The fruit and sap are highly poisonous, but sleeping beneath the branches does not cause death, as was erroneously supposed. See UPAS.

Manganese. A metal resembling cast iron. Equivalent, 27.6; symbol, *Mn;* specific gravity, 8.

Manger. A small space athwart the deck of a ship of war immediately abaft the hawse-holes, and separated on the after part from the rest of the deck by the *manger-board*, a strong coaming rather higher than the hawse-holes, serving to prevent the ingress of the sea when the cables are bent.

Mangrove. The mango-fish.

Manifest. A list of the vessel's cargo, containing the marks and number of each separate package, the names of the shippers and consignees, a specification of the quantity of goods contained in each package, as rum, sugar, etc., and also an account of the freight corresponding with the bills of lading.

Manila, the capital of all the Philippine Islands, situated on the island of Luzon, at the mouth of the river Pasig, in lat. 14° 36′ N., lon. 121° E. Vessels of some hundred tons may come up as far as the bridge. The city is very strongly fortified. A royal marine school, commercial school, barracks, arsenal, and custom-house are among the principal buildings. It is admirably situated for trade, and is the centre to which all the productions of the Philippine Islands flow, and its exports consist of sugar, tobacco, indigo, and manilla hemp, gold-dust, coffee, etc., but it is also widely known for its cigars and cheroots. Pop. about 100,000.

Manilla, or Manila. A fibrous material obtained from the *Musa textilis*, a plant allied to the banana; used for hawsers and running-gear. It is light and flexible, and does not require tarring.

Manly, John, Captain U.S.N. In command of the schooner "Lee," Capt. Manly, acting, it is believed, under the authority of Gen. Washington, in November, 1775, captured the transport "Nancy," loaded with munitions of war and bound to Boston for the use of the British army; thus transferring the ownership and use of the cargo from the British to the American army. The event was announced in a letter from Gen. Washington to Congress of 30th November as one of great importance, furnishing our army with many essential articles of which it had been in great want. While in this command Capt. Manly made other valuable captures. His zeal and enterprise attracted the attention of Congress, and that body, on the 17th April, 1776, appointed him a captain in the navy, and gave him the command of the frigate then building in Massachusetts Bay, afterwards called the "Hancock," of 32 guns. In this frigate, after a severe action of more than an hour, Capt. Manly captured the "Fox," of 28 guns, and ordered her into port, but she was recaptured by the "Flora" of 32 guns. In July, 1777, Capt. Manly, after a chase of more than thirty hours, was captured by the frigate "Rainbow," Sir George Collier, of 40 guns, and the brig "Victor." Capt. Manly displayed great seamanship in his attempt to escape from this greatly superior force, but fortune proved unpropitious in this instance, and the "Hancock" was surrendered. The "Boston," Capt. Hector McNiel, was in company with the "Hancock" when the "Rainbow" was first discovered, but she afforded no assistance. Capt. McNiel was dismissed from the service for his conduct in separating from the "Hancock."

The conduct of Capt. Manly was investigated, but the result left him without reproach. Having been exchanged, he took command of the privateer "Cumberland," and while cruising in her was captured by the frigate "Pomona" and carried into Barbadoes. Being there denied the privilege of parole, he made his escape, and we next find him in command of the privateer "Jason," in which vessel he was, in July, 1779, attacked by two British privateers, one of 18, the other of 16 guns. Reserving his fire, Capt. Manly ran between them, and poured his starboard broadside into one and his larboard broadside into the other, and both struck their colors to him. In September, 1782, Capt. Manly was appointed to the "Hague" (formerly the "Deane"). Cruising in the West Indies he made a wonderful escape from an overwhelming force, the particulars of which are not, however, sufficiently known to be stated with any degree of confidence. An account of his having grounded on a sand-bank near Guadaloupe, and while in that situation having sustained the broadsides of four ships of the line within point-blank shot for three days, has been published, but is probably mythical. The affair, however, gained Capt. Manly much *éclat*, and on his safe return to Boston he was received with distinguished attention by the citizens. He died in Boston in 1793.

Mannheim, on the right bank of the Rhine, between it and the Neckar, in the grand duchy of Baden, is admirably situated for commerce owing to its position on two important navigable rivers and its excellent artificial port. The trade has been very much extended, and it is now the first commercial town of the duchy. The principal articles of trade are tobacco, corn, petroleum, fruits, wine, hops, ironmongery, cattle, etc. Pop. 47,000.

Mantillis. A kind of shield anciently fixed upon the tops of ships as a cover for archers.

Mantissa. The decimal part of a logarithm.

Map. A representation upon a plane of, or a portion of, the surface of the terrestrial or celestial sphere. When the water is the principal subject of consideration, the delineation is known as a chart (which see).

Marabut. A sail which galleys hoisted in bad weather.

Maranhão is a city of Brazil, situated on the island of Maranhão, in lat. 2° 31′ S., lon. 44° 18′ W. On the north and south it is encircled by the small streams São Francisco and Maranhão, at the mouths of which is a basin accessible at high-water to vessels drawing 20 feet. The trade is of great importance, the provinces of Pará, Piauhy, Ceará, Rio Grande do Morte, and Gayaz having here the entrepôt for their produce. The principal exports are rice, cotton, rum, drugs, isinglass, and hides. Pop. 32,000.

Marblehead, a port of entry in Essex County, Mass., on Massachusetts Bay, is situated on a small, uneven, and very rocky peninsula. Its harbor is narrow, deep, and safe, and will admit the largest vessels. Its prosperity is partly derived from commerce and the fisheries, and many vessels are owned by its citizens. Pop. 8000.

Marches. Borders or confines of a country.

Marena. A kind of fish somewhat like a pilchard.

Mare's Tails. A peculiar modification of the cirrus, indicating wind. They consist of wisps, fibres, and streaks.

Margot. A fish of the perch kind, found in the waters of Carolina.

Marinarus. An old term for a sea-faring man.

Marinate. To salt fish and afterwards preserve it in oil or vinegar.

Marine. Pertaining to the sea. A sea-soldier. *Dead marine*, an empty bottle.

Marine Barometer. A barometer adapted for use at sea, the tube being contracted to avoid sudden oscillations in consequence of the rolling of a vessel.

Marine Glue. See Glue, Marine.

Marine Governor. A governor for marine engines, intended to counteract the effect of the ship's motion on the engine, and prevent racing. See Governor.

Marine Officer. An officer of the marine corps (which see).

Marine Corps. Soldiers enlisted for service either on shore or on board of ships of war are known by the distinctive name of *Marines*. In nearly all maritime countries, claiming to be war powers, they constitute a separate military body, trained to fight either as infantrymen or artillerists, and especially for participation in naval engagements. They are organized, clothed, and equipped very much as soldiers of the land forces, and their preliminary instruction is usually the same. For these reasons they become qualified for duty with either the army or navy, and therefore are of double value to the nation which employs them. Their headquarters, barracks, and depots are on shore, and from them details are made when required for service on shipboard. These detachments vary in size with the ship, from a dozen men under a sergeant to a hundred under one or more commissioned officers, and are all called "marine guards."

The marine guard of a man-of-war has been aptly described by one writer as "its backbone," and by another as "the bulwark between the cabin and the forecastle." To fully appreciate the force of the latter comparison one needs to bear in mind that all nations contribute quotas to the vast throng which follows the sea, and that in the larger vessels are often found motley crews containing elements exceedingly heterogeneous and reckless, sometimes desperate, and always with capacities for mischief highly cultivated. The muster-roll of the U. S. steamer "Shenandoah," a ship of medium size, serving in the European Squadron, 1873, at one time exhibited 21 nationalities, some scarcely half-civilized. In the frigates and large ironclads the proportion of officers to crew is as 1 to 12, and sometimes as 1 to 18, and the result of a mutinous conflict with such odds, and without any interposition or assistance, could hardly fail to be most lamentable. Unfortunately, such things have happened in the past, but "the bulwark," although severely tested, has seldom been found wanting. The support afforded by "a steady column of bayonets," remarked Rear-Admiral Chas. Stewart, "has made mutinies scarce." His successor, as the senior officer of the American navy, Admiral Farragut, "always deemed the marine guard one of the great essentials of a man-of-war;" and the distinguished and accomplished Admiral Wilkes wrote: "The marines constitute the great

(I had almost said the only) difference between a man-of-war and a privateer." Commodore Perry, also of world-wide fame, said: "Marines on board of ships of war are not only necessary to the proper preservation of discipline, but are useful in the ordinary duties of the vessel;" and the gallant and impetuous Porter (present admiral of the navy) declared: "If the marines are abolished, half the efficiency of the navy will be destroyed. They are as necessary to the well-being of a ship as the officers." Long before them the immortal Nelson was wont to remark that when he became first lord of the admiralty "every fleet should have a perfect battalion of marines," and the Earl of St. Vincent, another famous English admiral, urged upon his countrymen that "without a large body of marines we shall be long, very long, before an efficient fleet can be sent to sea."

The origin of the marine service is of very great antiquity. Capt. Luce, of the U. S. Navy, in a most interesting chapter written for "The History of the U. S. Marine Corps," prepared by Capt. R. S. Collum, U.S.M.C., and M. Almy Aldrich, Esq. (Boston, 1875), recites that the employment of marines as a part of the regular complement of vessels of war was common to the Phœnicians and to all of the maritime states of Greece at least five centuries before the Christian era. Prior to that time the warriors were the oarsmen; but as naval science progressed and the size of vessels increased, there gradually sprang up two distinct classes, which together made up the *personnel* of the navies about 500 B.C. These were the rowers, or seamen proper, who had the management of the vessel, oars, and sails, and the marines or fighting men. Marines are specially mentioned in the accounts of the battle of Lâdé, in the time of Darius, king of Persia, about 497 B.C. In this battle between the Greeks and Persians, over 100 Greek ships had each "forty armed citizens on board, and those picked men." The Persians also carried soldiers in their vessels. To the Greek soldiers was given the name *epibatæ*, a term which all authorities agree in rendering into English by the word *marines*.

The largest number of these men found on board of the regular war-ships at this period was 40. Plutarch says that at Salamis each Greek trireme carried 18. Thucydides makes frequent mention of them in his writings, and Boeckh remarks that even in those ancient times these *epibatæ* were a corps entirely distinct from the land soldiers and belonged to the vessels. They had, moreover, their own officers, called *trierarchoi*. During the naval supremacy of Rome, the larger vessels carried 300 rowers and 120 marines (*classiarii milites*), and in fighting, the latter "used arrows and darts at a distance, spears and swords in close combat, and as vessels increased in size they added the *balistæ* and *turres* (turrets), and fought from them as from castles on land."

In the early history of the English navy we read of men-at-arms still serving afloat, their armor and weapons differing but little from those of the ancients. The Scandinavians called them *bat-karler*, or sea-soldiers, that is, carls or sturdy fellows who fought in boats. Later, they were called *supra-salientes*, a word still preserved in the Spanish *sobiesaliente*, a military term which literally means "surpassing, excellent." It is recorded that Genoese cross-bowmen, the best marines of the period, were in the 13th century employed and very highly esteemed in the English ships, and that in August, 1387, Sir Henry Percy ("Gunpowder Percy") was appointed captain of all the men-at-arms and archers of the fleet. He was, in fact, commandant of marines.

The introduction and gradual increase of naval ordnance caused the occupation of men-at-arms afloat to become auxiliary instead of principal, and the employment of marines in their present form seems to date from 1653, when Admiral Blake embarked a number of soldiers to act as small-armsmen in the battle with Von Tromp, off Portland. The famous corps of marines of Great Britain was originally instituted in 1664. Beaude states that in 1684 mention is made of the Duke of York's "maritime regiment of foot," and that during the reign of William III. several regiments of foot were placed on the marine establishment, but subsequently disbanded. In the beginning of the reign of Queen Anne "six regiments of maritime soldiers" were raised, and these also were disbanded in 1749. The necessity for this kind of troops was so pressing, however, that six years later 130 companies, numbering above 5000 men, were raised upon the recommendation of the great English admiral, Lord Anson, and it is recorded that, in 1760, this force had grown to 18,000. We are also informed that in 1740 three regiments of marines were raised in America, and assembled at New York. All of the officers, except the captains of companies, who were colonists, nominated by the provinces, were appointed by the crown, and Col. Spotiswood, of Virginia, was made colonel commandant of the whole. This is a grade superior to colonel, and seems to be peculiar to the marine service.

Nicolas, in his history of the royal marine forces, pays handsome tribute to their valor and gallantry in many a hard-fought action, and Capt. Luce adds that on no occasion did they prove themselves of more value to their country and to the navy to which they belonged, or reflect more honor on their corps, "than during the momentous period covering the great mutinies at Spithead, the Nore, and Bantry Bay."

This inestimable quality of the marine—fidelity—no doubt arises from that want of sympathy with the sailor which his military training, habits, and *esprit de corps* create. In concluding his chapter, Capt. Luce says that the "United States marine corps has well sustained the high reputation for steadfast courage and loyalty which has been handed down to it from the days of Themistocles," and, might have added, wears with pardonable pride and jealous care the title of "*Ever faithful.*"

We come now to the genesis of this particular corps, which antedates the organization of the regular navy and the Declaration of Independence. November 10, 1775, the Continental Congress, to promote the "publick defense," cautiously

"*Resolved*, That two battalions of marines be raised, consisting of one colonel, two lieutenant-colonels, two majors, and other officers, as usual in other regiments; that they consist of an equal number of privates with other battalions; that particular care be taken that no persons be appointed to offices, or enlisted into said battalions, but such as are good seamen, or so acquainted with maritime affairs as to be able to serve to advantage by sea when required; that they be enlisted and commissioned to serve for and during the present war between Great Britain and the colonies, unless dismissed by order of

Congress; that they be distinguished by the names of the First and Second Battalions of American Marines."

This was the first step taken toward the creation of the naval establishment which has won such imperishable fame for the United States, and upon it is based the claim of the marine corps to be "the oldest in the service." Aldrich says that "before a single vessel of the navy went to sea the corps was organized," and, further, that a detachment of it gained on the island of New Providence, one of the Bahamas, early in 1777, "the first fight in the history of the regular navy." In this noteworthy engagement the attacking party, consisting of 300 marines and landsmen under Major Nichols, captured the forts and other defenses of the enemy after a struggle of a few hours, and secured a quantity of stores and British cannon. The marines belonged to the fleet of Commodore Hopkins, who was operating against Lord Dunmore.

During the following years of the Revolution they were found at work proving their patriotism and devotion to the cause which gave them being; and, in fact, throughout their entire existence they have been, as will be seen, in the front rank of the Republic's defenders, zealous participants, *per mare et terram*, in nearly every expedition and action of moment in which the navy has been engaged; and in many trying campaigns with their brethren of the army have won distinction for themselves and honor for their country. The globe (which is one of the emblems of the corps device) has been their stage, and every zone has heard their watch-cry, "All's well!"

The patient labors of Capt. Collum have put many of their deeds of record, so that one can now follow them with little effort. Conspicuous among these is their part under John Paul Jones, in the action between the "Ranger" and the "Drake," in which Lieut. Wallingford, of the marines, lost his life at the head of his men; again, in the great battle between the "Bon Homme Richard" and the "Serapis," in which they numbered 120 rank and file, led by Lieut.-Colonel Stack and two lieutenants; in the fight between the frigate "Philadelphia" and the Tripolitans, where, "after most gallant exertions," Lieut. Osborne and his guard were made prisoners; in the attack on the Tripolitan gunboats, August 3, 1803, in the course of which Lieut. Trippe, engaged in a hand-to-hand fight with a Turk, was saved by a sergeant, who "passed a bayonet through the body of the Turk"; in the remarkable march of Gen. Eaton from Alexandria to Derne, nearly 600 miles through Northern Africa, where a small detachment of marines under the brave Lieut. O'Bannon, mounted on camels and asses in the caravan, leavened the lump of Arabs and Greeks in the service of the United States, and in the attack on Derne stormed the principal work, took possession of the battery, planted the American flag *for the first time on a fortress in the Old World*, and turned its guns upon the enemy. Thereafter "Tripoli" was engrossed on the banners of the marine corps.

During the war of 1812 they were exceedingly active at sea and on shore. In the glorious victory of the "Constitution" over the "Guerriere," the first officer killed was Lieut. Bush, who commanded the marine guard, and with his junior, Lieut. Contee, was assisting in repelling boarders "at a critical moment of the engagement"; in the victory of the "United States" over the "Macedonian," Lieuts. Anderson and Edwards fought the marines "with the utmost steadiness"; in the brilliant operations of the "Essex" in the Pacific Ocean, Lieut. Gamble gained great reputation for "skill and efficiency," commanding in turn his guard, a prize-ship, and a fort at Nuka Hiva, in the Marquesas Islands; in the bloody battle between the "Shannon" and the "Chesapeake," Lieut. Broom and 11 of his men were killed and 20 wounded; in the ever memorable battle of Lake Erie, Lieut. Brooks, of the "Lawrence," was killed, and 18 marines of the fleet placed *hors de combat;* in the battle of Lake Champlain the marines suffered severely; when the frigate "Constitution" captured the corvettes "Cyane" and "Levant," Capt. Henderson was "specially mentioned"; in the struggle between the "President" and the "Endymion," Lieut. Twiggs "particularly distinguished himself"; and in the fight on Lake Ponchartrain, the senior marine officer was killed, making four-elevenths of the officers of the corps who were slain in that war.

On shore, they were with the army under Scott (then colonel) in Canada; with Gen. Winder at Bladensburg, where, after the militia ingloriously fled, they, with Commodore Barney's sailors, "kept the whole British force at bay until there was scarcely a man on our side who was not killed or wounded," Capt. Sevier wounded and Capt. Miller (afterwards lieutenant-colonel) wounded and a prisoner; with Gen. Jackson at New Orleans, where Maj. Carmick was wounded; at North Point, Baltimore, where the British were driven off; and in sundry affairs on the coast of Maine and shores of Chesapeake and Delaware Bays. Near Norfolk, "Lieut. Breckenridge, with 150 marines, assisted in preventing the enemy's boats from ascending James River."

In the interval between 1815 and the Florida war (1836–37) they were called upon, among other things, to quell a serious revolt in the Massachusetts State prison, which was done; to act against Spanish pirates in the West Indies and Malays in Sumatra; and to guard public and private property at the time of the great fire in New York (1835), for which they received a vote of thanks from that city. When Indian hostilities broke out in Georgia in 1836, the disposable force of the army being found inadequate, Col. Comdt. Henderson promptly volunteered his services and those of the corps serving on shore. They were accepted, and their places at the navy-yards temporarily filled by watchmen from civil life. Two battalions proceeded to Charleston from rendezvous at New York and Fortress Monroe, and thence went to Fort Mitchell, Ala., where they were consolidated into a regiment and sent to Tampa Bay *via* Apalachicola. In the everglades they shared the arduous campaigns of Gen. Jesup against the treacherous Creeks and Seminoles, "bearing an honorable and important part at Hatchee-Lustee" (January 22, 1837), and in other actions. Besides these, two companies (130 men) served in the Mosquito Fleet on the west coast, co-operating. Their combined losses were 48 men, killed or died.

From 1846–48 the corps was engaged in the

war with Mexico, where it figured in every quarter, and made a most excellent record. Several detachments were on the Pacific side with Commodores Sloat, Shubrick, and Stockton; others in the squadron on the east coast under Commodores Connor and Perry, and at times with the army under Gens. Scott, Taylor, and Worth. They were present at the capture of Monterey, San Francisco, and Mazatlan; fought at Los Angeles, San Diego, San Gabriel, San José, and Guaymas, and with such credit that Commodore Shubrick recommended the government to double the guards of all vessels coming to the station, reducing, if necessary for the purpose, the complements of ordinary seamen and landsmen. On the east coast they were engaged in the capture of Matamoras, Tampico, Frontera, Tabasco, and Vera Cruz. The first battalion, which came from Fort Hamilton, New York harbor, joined the main army at Puebla in June, 1847, and being assigned to Gen. Quitman's division, in which Lieut.-Col. Watson, of the marines, commanded the second brigade, participated in all of the brilliant operations which marked the march to the city of Mexico, where it was with the first portion to enter the Grand Plaza, and was specially detailed to clear the ancient palace of intruders and protect it from spoliation, a fact which completes the explanation of the inscription since found on the corps banners: "From Tripoli to the Halls of the Montezumas."

The crowning honor, however, was at Chapultepec, September 13, where the party assigned to the storming of the castle—120 men, "selected from all corps"—was led by Maj. Levi Twiggs, and the pioneers, equipped with ladders, pick-axes, and crows, by Capt. John G. Reynolds, both of the marine corps. Gen. Quitman, in his official report, dated National Palace, Mexico, September 29, says: "The storming-parties led by the gallant officers, who had volunteered for this desperate service, rushed forward like a resistless tide. For a short time the contest was hand-to-hand; swords and bayonets were crossed and rifles clubbed. Resistance, however, was vain against the desperate valor of our brave troops." The gallant and lamented Twiggs fell on the first advance at the head of his command, and Lieut.-Col. Watson died in Vera Cruz two months later. In March, 1848, a second battalion of four companies of 90 men each, commanded by Maj. John Harris, sailed from New York to co-operate with the squadron on the Isthmus of Tehuantepec; but on their arrival at Vera Cruz the war was virtually over, and they were ordered to garrison Alvarado.

A few years later (1852–53) some of these Mexican heroes were marching to the same music through the streets of Yeddo, the capital of Japan, as a part of the celebrated expedition of Commodore Perry. Brevet Maj. Zeilin was the second person to land, and "the presence of these trained American soldiers contributed in no small degree to the speedy success achieved." In 1856 we find a detachment from the "Decatur" fighting Indians at Seattle, Washington Territory, and another from the "San Jacinto," "Portsmouth," and "Levant," attacking the Chinese and demolishing the Barrier Forts of Canton.

During the Know-Nothing political excitement of 1857 they were ordered out by the President, upon request of the mayor of Washington, to suppress an armed mob of "Plug-Uglies" from Baltimore who had overawed the police. These miscreants hooted and defied the marines, and showered stones and pistol-shots, but a well-directed volley caused them to disperse and seek shelter.

In 1858, 40 marines and sailors from the "Vandalia" had a fierce conflict in the Fiji Islands with a body of 300 naked warriors who had killed two American merchants. The natives were punished, and the Secretary of the Navy pronounced the conduct of the officers and men as "in the highest degree commendable." The same year a detachment from the Brazil Squadron was landed in Montevideo, upon application of the governor, to protect the lives and property of the foreign residents from domestic violence. Brevet Maj. Reynolds commanded, and they remained until the revolutionists capitulated. In the Paraguay Expedition there were 8 marine officers and the usual complements of men. At home, in August, when the enraged citizens of Staten Island burned part of the quarantine buildings through fear of yellow fever, 65 marines were sent from Brooklyn to protect those remaining "at all hazards," and did, although the rioters, fully armed, made further attempts at arson.

October 17, 1859, the United States were convulsed by news of the John Brown insurrection at Harper's Ferry. The President ordered Col. Comdt. Harris to send forward the available force at headquarters by special train, and 100 men, with a battery of Dahlgren howitzers, were at the railroad depot in one hour. They were met by the Secretaries of War and the Navy, who gave Lieut. Greene, commanding, his instructions. Upon arrival they found the militia held in check by the insurgents, who had been driven into an engine-house. Under the orders of Col. Robert E. Lee, then in the U. S. army, the marines assailed the barricaded engine-house, using a long ladder as a battering-ram, and, after killing two of the band and mortally wounding another, captured the "remarkable old man" and the remainder of his followers. Scouting-parties sent into the country captured 1500 pikes. One marine was mortally and another slightly wounded.

In March following, 50 marines and sailors from the "Marion" were instrumental in saving from destruction the property of the American residents of Kisembo, on the west coast of Africa, and on the 27th of September another party was landed from the sloop "St. Mary's," at Panama, to protect the Isthmus railroad. On the 28th the governor delivered up the city to the joint occupation of the men of the "St. Mary's" and of the British ship "Clio." Since then Panama and the railroad have been repeatedly guarded by our marines and sailors.

The Great Rebellion (1861–65) made the next special demand upon the services of the marine corps, and they were rendered "nobly and well" afloat (Alden), and "admirably in camp and field" (Dahlgren). In the beginning, when the defections from the army and navy occurred, the marine corps, being largely composed of Southern men, lost its full share of officers. There

were in all 6 resignations and 14 dismissals (those who tendered their resignations after May 1, 1861, being summarily dismissed). The last to leave was First Lieut. A. W. Stark, January 9, 1862. These vacancies were rapidly filled by loyal men, and July 25, Congress authorized a large increase to be made by the appointment of candidates between 20 and 25 years of age, which caused 50 of the 60 lieutenants to be young and inexperienced.

The first duty to which it was called was on January 7, when 250 artillery and marines left New York during the night on the steamer "Star of the West" to reinforce the beleaguered garrison of Fort Sumter.

During the same month Lieut. Hebb (now lieutenant-colonel) was sent with a detachment to garrison Fort Washington on the Potomac, near the capital, and on the 22d the force at the Brooklyn barracks was put under arms to repel a rumored assault by rebel sympathizers on the navy-yard. April 12, Lieut. Cash (since major), with the guard of the frigate "Sabine," reinforced Fort Pickens, Fla., and on the 20th, the garrison at Norfolk, and the guards of the "Pennsylvania," "Cumberland," and "Pawnee," acting under orders, destroyed the navy-yard and ships at that place, spiking the heavy guns and breaking up thousands of small-arms. "At midnight, when the moon sank, the barracks near the centre of the yard were set on fire, that by the illumination the work might be continued."

In the first battle of Bull Run, or Manassas, a battalion of 350 officers and men, mostly recruits, commanded by Major Reynolds, served in Porter's brigade as the support of Griffin's battery. Lieut. Hitchcock and 8 men were killed, 2 officers and 17 men wounded, and 16 missing. At the capture of Hatteras Inlet, in August, the marines of the "Minnesota," "Wabash," and "Cumberland," under Capt. Shuttleworth (afterwards colonel), landed with the troops of Gen. Butler in surf-boats and entered Fort Clarke. When the Confederate privateer "Judah" was destroyed at Pensacola by a boat expedition at night, in September, the first to board was a private of marines, who, by a mistake, having lost his distinguishing mark, was subsequently killed by one of his own party. In the Dupont Expedition and battle of Port Royal they took a prominent part, and after the victory occupied the captured forts until relieved by the army. A separate battalion, Major Reynolds (afterwards lieutenant-colonel), accompanied the armada in a transport called the "Governor," which was wrecked at sea, but the troops were luckily rescued by the "Sabine," with a loss of 7 men. In nearly all of the expeditions and actions which followed, along the coasts and up the rivers of South Carolina, Georgia, and Florida, the marines shared as sharpshooters, skirmishers, or artillerists, leading advances, covering retreats, building batteries, repelling torpedo-boats, or garrisoning captured towns. The mayor, city council, and citizens of St. Augustine paid "the urbanity of the officers and good conduct and discipline of the troops" exalted compliment, and begged that they might remain.

In the celebrated "Trent affair" 8 marines from the "San Jacinto" bore a very dramatic part, subduing the defiant and insulting attitude of the passengers and crew while the Confederate commissioners were being removed from the ship. The first shot from the ironclad "Merrimac" killed 9 marines on the "Cumberland," and in the hopeless resistance made by the "Congress" their faithful blood crimsoned the decks. In this most famous of modern naval battles the marines of the "Minnesota," "Roanoke," and "St. Lawrence" were also engaged, and "justly won the praise of the officers under whom they acted and of the whole of the loyal nation" (Aldrich). At Roanoke Island, off Wilmington, in the operations in the sounds of North Carolina, and in the James and Potomac Rivers, they also assisted, and were on the blockade of all the principal ports, suffering a heavy loss when the fleet off Charleston was raided by 2 rebel ironclads from within in 1863. One hundred and fifty men, Capt. Kintzing (now colonel), guarded the naval stations at Cairo and Mound City, Ill.; 30 were on the flag-ship "Black Hawk" in the Red River Expedition, and a thousand more could have been advantageously employed in the Mississippi Squadron, but they could not be spared. Ten thousand marines were really needed for this war, but the opportunity, like many others, was allowed to pass unimproved. The Marine Brigade, a kind of substitute, which operated in steam-rams and transports on the Western rivers, was a volunteer organization, and had no connection with the marine corps.

On the lower Mississippi, and in the terrible tumult at the passage of the forts, "they more than maintained their reputation" (Admiral Boggs). The honor of perfecting the conquest of New Orleans, of hoisting the stars and stripes, and holding that excited and turbulent city until the arrival of the army under Gen. Butler (May 1), fell to a battalion of 250 marines of Farragut's fleet, under Capt. J. L. Broome. June 28, in passing the batteries at Vicksburg, the guard of the "Hartford" fought the broadside-guns, and the following March, at Port Hudson, the guards of the "Hartford," "Richmond," "Mississippi," and "Monongahela" were badly cut up. Capt. Ramsay, in command of the marine division of the "Richmond," had *nearly a whole gun's crew swept away by a single shot.*

December 7, 1862, 2 companies, Major Garland, going to California *via* Panama, on the mail-steamer "Ariel," were captured by Semmes off the coast of Cuba. A rebel lieutenant addressed the command and offered every inducement to get 20 volunteers for the marine guard of the "Alabama," but not a man proved recreant to his trust. They were paroled, and proceeded on their journey. During July, 1863, the "Draft Riots" provided duty for a battalion at home, which won "marked approbation" in New York, quelling the disturbances and guarding the public property. In August, a second battalion, Major Zeilin, was sent from New York to the South Atlantic Squadron to co-operate in the attack on Charleston, and to relieve the marines of the ships who had helped to erect the naval battery. It was encamped on Morris Island, and, September 8, furnished 6 officers and 100 men, all volunteers, under Capt. McCawley, to engage in the combined night attack on Fort Sumter, in which Lieut. Bradford was mortally wounded, Lieut. Meade captured, and

30 men killed, wounded, or missing. Ten officers and 104 men of all corps were taken prisoners.

When the career of the "Alabama" was so abruptly ended by the "Kearsarge," off the coast of France, it was fitting that the marines should begin the fight on our part, which they did from a rifle-gun on the forecastle, "firing rapidly and effectively throughout, and nobly sustained the high repute of their service" (Thornton). The same year, on board of the "Wyoming," they were fighting the Japanese in their forts at Simonosaki, where private Furlong was killed and another wounded. At Mobile, "one of the fiercest naval combats on record" (Farragut), "the marines performed most efficient service" (Drayton). And the medals of honor received by them for this action and the previous battles on the Mississippi made a long list. About this time, Capt. Heywood, the senior marine officer (aged 25), could muster nearly 800 marines in the fleet of Admiral Farragut.

A notable illustration of their usefulness in emergency occurred in this year. The steam-frigate "Wabash," returning North in October to get a new crew, went ashore on the outer edge of Frying-Pan Shoals. She was short-handed, and manned principally by negroes, landsmen, and boys. Finding it impossible to get a kedge-anchor out otherwise, Capt. De Camp called on the marines, under Lieut. Fagan, who responded with alacrity, filed into the boat, took the oars, placed the anchor, and when the tide rose the noble ship floated and was hauled off safe. In after-years, Capt. De Camp (since rear-admiral) told the writer that "the 'Wabash' owed her life to Fagan's marines." Thirteen years previously, in the East Indies, Lieut. Broome ran a bower-anchor from the sloop "Marion," which was ashore in the breakers of Formosa. She got off, and he was thanked on the quarter-deck by Commander William Glendy.

In November, 1864, two batteries of naval howitzers and nine companies of marines and sailors, under Commander Preble, ascended Broad River, S. C., to co-operate with Gen. Foster in establishing connection with Gen. Sherman, who was coming to the sea. On the 30th they were repulsed at Boyd's Neck; but on the 6th of December made a successful attack at Tulifinny Cross-roads. Killed and wounded, 21. First Lieut. George G. Stoddard commanded the marines, who numbered about 300. When Charleston was abandoned, Lieut. Stoddard occupied Georgetown, S. C., with six companies of marines, and Lieut. Breese, with one company, held the battery of 15 guns. Seven companies, with only two first lieutenants to officer them, recalls the fact that a Federal brigade at Pensacola, with a general, colonels, majors, etc., contained fewer men than Capt. Heywood had in the marine battalion of the fleet.

Among the last and most momentous events of this war were the two attacks on Fort Fisher. About 60 vessels constituted the fleet, and many of them, being heavy steamers, carried large guards. Lieut. Pile, of the "Juniata," was killed in the first attack, and over 50 enlisted men were either killed or wounded in the second, where 1400 marines and sailors constituted an assaulting column. While the conduct of the marines, as a body, in this terrific struggle has been the subject of more discussion than in any other enterprise that they were ever engaged in, there can be no doubt of the individual gallantry of officers and men, many of whom were specially commended and rewarded for conspicuous service. The unfortunate failure to organize the different marine detachments thrown together on the beach leaves a blot and teaches a lesson which, like the story of the "Chesapeake" and the "Leopard," should never be forgotten, and which it would not be honest to ignore in view of the deluge of praise and thanks of Congress which they received elsewhere in this great war.

The government having determined to bring the industrious Raphael Semmes to trial for his depredations on the high seas, Lieut. French was sent with two sergeants in December, 1865, to arrest and deliver him in Washington. After visiting Memphis, Vicksburg, and New Orleans, he was found in Mobile and brought to the capital, where he remained a close prisoner at the marine barracks until April, when he was released without trial and restored to his parole.

When Portland, Me., was devastated by fire, July 4, 1866, as is usual in times of public distress or excitement, the evil-disposed from other cities gathered for plunder. The authorities telegraphed to Portsmouth Navy-Yard for marines, and in a few hours Lieut.-Col. Jones arrived with two companies. Lines of sentinels were posted in the burned district, many persons arrested, and quiet restored. From 1867 to 1871 the illicit distillation of whisky, upon which there was a high tax, gave great trouble to the revenue officials, and they frequently met with such fierce resistance that it became necessary to call on the marine garrisons of Philadelphia and Brooklyn for assistance. This was given, but proved to be a most delicate and dangerous duty, more unwelcome than actual war. Violent mobs armed with revolvers, stones, and bricks had to be encountered and overcome, and murderous missiles from housetops were frequent incidents. Lieut.-Col. Broome had the largest share of this disagreeable work to do, and received the approval of the government for himself and command.

An unsuccessful attempt, in 1867, to punish some savages on the island of Formosa, who had murdered the crew of the American ship "Rover," was shared in by 43 marines from the "Hartford" and "Wyoming," under Capt. Forney. Better success attended a boat expedition from the "Mohican," in June, 1870, which captured and burned in a Mexican river, near Mazatlan, the piratical steamer "Forward." First Sergeant Moore and a corporal received "special notice." In 1871 a very serious fight occurred in Corea, in which 4 officers and 105 marines from the "Colorado," "Alaska," and "Benicia," under Capt. Tilton, fleet marine officer, formed portion of a landing-party of 680 men. They advanced through a strange and rough country, the marines leading, and stormed a citadel upon a hill 150 feet high; overcame a garrison of several thousand men, killing 243; captured 50 flags and 481 pieces of ordnance, besides many match-locks and gingalls. Commander Kimberly, U.S.N., gave the marines full honor as the advance-guard, and Lieut.-Commander Casey reported that "their conduct excited the admiration of all."

July 13, 1869, Lieut. Breese was ordered from the marine barracks, Brooklyn, to report to Gen. Barlow, U. S. Marshal, to aid in preventing a violation of the neutrality laws. He proceeded in the revenue-cutter "Mahoning" to Gardiner's Island, at the east end of Long Island, where, on the 16th, with a company of 50 marines, he surrounded a camp of Cuban filibusters and captured 125 of them. The prisoners were sent on board of the "Mahoning" and carried to New York, where the expedition arrived next day.

The great fires in Boston, November 9, 1872, and May 30, 1873, called them out again, and enabled them to render very valuable service to the city and United States authorities. Capt. Collum, who commanded on each occasion, obtained for himself and men "most complimentary recognition." A month later, at Callao, Peru, Capt. Pope received the thanks of the Italian government for services rendered on the occasion of a fire on a vessel belonging to that nation.

The war-cloud which arose after the "Virginius" massacre caused a great fleet to gather at Key West, in 1874, to menace Cuba, and the opportunity was improved by landing 650 marines, who were found in excellent condition for active service. In 1877, the terrible and unprecedented labor riots, which paralyzed business in nine States, and led to wholesale arson and murder, culminating in Pittsburgh, called all of the available regular forces into the field. Marines were taken from ships and barracks; a battalion was sent to Baltimore, another to Philadelphia and Reading, and companies to garrison the U. S. arsenals at Watervliet, Frankford, and Washington, D. C., all coming under the command of Maj.-Gen. W. S. Hancock (see "United Service" magazine, Philadelphia, 1879). They encamped in depots, patrolled streets, dispersed angry mobs, arrested the destruction of property, escorted railroad trains into the interior (riding on the locomotives), and guarded public and private interests with such zeal, that Gen. Hancock, in returning them to their stations, wrote: "Citizens and soldiers are united in admiration of the soldierly bearing, excellent discipline, and devotion to duty displayed by them," and inclosed a report of an official inspection made at Reading by the venerable Col. Cuyler, of his staff, who said: "I do not recollect ever having seen a more soldierly or a more orderly set of men." The Secretary of the Navy reviewed them in Washington before they were dismissed, and in orders recognized the readiness with which they responded to the summons of the Department, and their proficiency in discipline, and pronounced them "a most important arm of the national defense, confidently to be relied upon whenever the public exigency shall call them into active service."

Their latest conspicuous special service was in France, where a picked company, sent out in the honored old frigate "Constitution," was stationed during the Universal Exposition of 1878, under Lieuts. Russell and Zeilin. They had charge of the American department, and the Hon. R. C. McCormick, Commissioner-General for the United States, reported to the Navy Department that "their excellent conduct, both on and off duty, were spoken of in the most complimentary terms by the French authorities, by the citizens of Paris, and the visitors to the Exposition," and at the ceremonies attending the distribution of prizes in October, their military bearing elicited "a grand outburst of enthusiasm, and they throughout reflected honor upon our flag by their admirable performance of an important duty in a foreign land."

This incomplete outline of the principal public services of the marine corps for 105 years exhibits an infinite variety, and gives some idea of the great utility and mobility of "web-footed soldiers." These qualities have helped to secure for them the highest commendations of the most famous naval commanders of every age, and when, in 1866, a proposition was made to abolish the marine corps as such and transfer it to the army, Congress was overwhelmed with the recorded views of such old heroes as Hull, Decatur, Bainbridge, Biddle, Parker, Perry, Morris, Stockton, Shubrick, and Tattnall, and of later days, Farragut, Porter, Rowan, Stringham, Paulding, Dupont, Sands, Rodgers, Foote, Davis, Worden, and Dahlgren,—a mighty list, which might be much further extended. As a result, the House Committee on Naval Affairs, charged with the resolution, not only reported adversely, but went so far as to say: "From the beginning this corps seems to have satisfactorily fulfilled the purposes of its organization, and no good reason appears either for abolishing it or transferring it to the army; on the contrary, the committee recommend that its organization as a separate corps be preserved and strengthened, and that its commandant shall have the rank of brigadier-general."* March 2, 1867, that grade was established, and continued until 1874, when selfish motives secured its abolition.

The marines, as an institution, certainly can make no serious complaint of lack of appreciation. Congress has *nineteen times*, by joint resolution, tendered its thanks to them, or expressed its high sense of their valor and good conduct, and the greatest generals have added their tributes to those of the naval commanders. Napoleon Bonaparte, when reviewing the marines of the "Bellerophon," exclaimed: "What might not be done with a hundred thousand such men!" Winfield Scott, in Mexico, said of our own, that he "put them where the heaviest work was to be accomplished, and had never found his confidence misplaced;" and Gen. Grant, on the quarter-deck of the "Vandalia," while crossing the Mediterranean, remarked that they were "as fine soldiers as he ever had seen."

Legislation affecting the marine corps has been abundant, and generally liberal. So long ago as January 8, 1780, Congress provided that "the marines of the navy of the United States whilst doing garrison duty be allowed the same subsistence moneys as the line of the army." At the close of the Revolutionary war, the poverty of the Confederation caused the battalions to be disbanded, and in 1787 there is record of a "commissioner of marine accounts" settling up the business of "the late navy of the United States." In 1794, the cupidity of Algerine corsairs compelled "the late navy" to be revived for the protection of commerce, and the President was

* He was then a colonel commandant, with a colonel, 98 other officers, and about 3600 rank and file under his orders, —the equivalent of two strong brigades.

authorized to provide for ships of 44 guns "one lieutenant, one sergeant, two corporals, one drum, one fife and fifty marines," and for those of 36 guns the same less 10. In 1797, when the frigates "United States," 44, "Constitution," 44, and "Constellation," 38, were ordered to be "manned and employed," the guards were increased, viz.: "two lieutenants, three sergeants, three corporals, one drum, one fife, and fifty marines" each to those of 44 guns, and "one lieutenant, two sergeants, two corporals, one drum, one fife, and forty marines" to those of 36. This was to last "a year and thence to the end of the then next session of Congress and no longer;" but by that time the act of July 11, 1798, was passed providing, "in addition to the present military establishment, a corps of marines, which shall consist of [see table of strength below], including the men who have already been enlisted or authorized to be raised for the naval armament."

The said corps was to be formed into as many companies as the President might direct, to be in lieu of the respective quotas which had been already established for the frigates and other armed vessels and galleys in the service. The pay and subsistence of officers were fixed, the highest rate being $50 per month and four rations per day, and that of the enlisted men "conformably to the act entitled an act providing a naval armament." The President was authorized to continue the enlistment of men to serve for three years; to appoint officers when vacancies occurred; to detach and appoint such of the officers as he might judge necessary to act on board of the armed vessels; to assign this corps, or any part of it, to duty in the forts and garrisons of the United States on the sea-coast, or to any other duty on shore, and when so serving the commandant was given power to appoint an adjutant, paymaster, and quartermaster, and non-commissioned staff-officers from the line, who were to have extra pay and allowances. All the members of the corps were to take the same oaths and be governed by the same rules and articles of war as may be prescribed for the military establishment (see OATHS), and by the rules and regulations for the navy according to the nature of the service in which employed; and in case of wounds or disabilities, were to receive the same allowances according to rank as are granted to the military establishment. The same act also exempted seamen and marines during their term of service from all personal arrest for debt or contract. The greater part of the above still remains in force.*

Table of Strength from November 10, 1775, *to October* 1, 1880.

	Brig.-Genl.	Col. Comdt.	Colonel.	Lieut.-Colonels.	Majors.	Staff-Majors.	Staff-Captains.	Captains.	First Lieuts.	Second Lieuts.	Non.-Com. Staff.	Sergeants.	Corporals.	Band.	Drummers.	Fifers.	Privates.	Aggregate.
Resolution, Nov. 10, 1775	...	...	1	2	2	...	...	8	8	8	...	...	...	...	...	...	......	......
Act July 11, 1798	...	...	...	...	1	...	...	4	16	12	...	48	48	...	16	16	720	881
Added March 2, 1799†	...	...	...	...	...	...	...	...	2	6	...	...	...	...	9	9	170	204
" April 22, 1800	...	...	...	1††	...	...	...	...	...	...	...	...	...	...	...	...	......	......
" March 3, 1809	...	...	...	...	1	...	...	2	2	...	...	...	185	...	...	...	594	784
" April 16, 1814	...	...	...	...	1	...	...	14	12	20	...	61	...	...	21	21	696	846
P. E. A., March 3, 1817‡	...	...	...	1	...	3	...	9	24	16	...	...	73	...	21	21	750	......
Act June 30, 1834	...	1	...	1	4	3	1	13	20	20	4	80	80	...	30	30	1000	1287
Added, act March 2, 1847§	...	....	...	...	...	...	...	4	4	4	...	25	25	...	25	25	1000	1112
Total	...	1	...	1	4	3	1	17	24	24	4	105	105	...	55	55	2000	2399
Act July 25, 1861	...	1	1	2	4	3	2	20	30	30	4	200	220	30	60	60	2500	3167
Authorized July 1, 1867‖	1**	...	1	2	4	3	2	20	30	30	4	240	260	30	60	60	3000	3747
" Oct. 1, 1880¶	...	1	1	2	4	3	2	20	30	15	4	190	180	30	48	48	1500	2078

From time to time the corps has been increased and reduced as war or peace or politics suggested (see table), and has now by law the strength of July 25, 1861, although annual appropriation has been made for one thousand privates less since 1874. The President has power to substitute marines for landsmen (act March 3, 1849); to provide regulations for their discipline; to

* Among the earlier acts passed by Congress relating to the marine corps are: an act for the establishing and organizing of a marine corps, June 11, 1798; an act authorizing an augmentation, March 2, 1799; to fix rank and pay of commandant (substituting lieutenant-colonel for major), April 22, 1800; an act authorizing an augmentation, March 3, 1809; an act for same purpose, April 16, 1814; to fix the peace establishment, March 3, 1817; resolution relating to compensation of officers, May 29, 1830; an act concerning certain officers, July 14, 1832; resolutions respecting the pay, May 25, 1832; an act to improve the condition of the enlisted men of the army and marine corps and prevent desertion, March 2, 1833; an act for the better organization, June 30, 1834; and an act making certain allowances to captains and subalterns, June 30, 1834.

† This act added 8 surgeons.

‡ Peace Establishment Act.

§ For the war with Mexico.

‖ By President, under act of March 3, 1849.

¶ By appropriation act.

** Substituted for colonel commandant March 2, 1867, and reversed June 6, 1874.

†† Lieutenant-colonel commandant substituted for major.

make alterations in the component parts of the ration; to retire officers who may be disabled, or have attained the age of 62 years; to advance officers not exceeding 30 numbers in rank for "eminent and conspicuous conduct in battle or extraordinary heroism"; to advance officers one grade who have received the thanks of Congress by name; to confer brevet commissions as in like cases in the army (act 1814); to fill vacancies in the line first by promotion and then by appointment; in the latter case to be between 20 and 25 years (if from civil life), and subject to mental and physical examination (act July 25, 1861).

Officers are on the same footing as to rank and privileges as similar grades in the army; take precedence of like rank in the volunteers and militia; may be associated with officers of the army on courts-martial, the senior to preside; are promoted by seniority up to colonel; cannot exercise command over the navy-yards or vessels of the United States (act June 30, 1834); and no officer can absent himself without leave until notified of the acceptance of his resignation. The staff is separate from the line, and appointed by the President by selection from the officers of the corps, as is the commandant. The judge-advocate-general of the navy may be appointed from the officers of the marine corps. (See JUDGE-ADVOCATE-GENERAL.) Both officers and men, when serving with the land forces, are entitled to transportation, subsistence, camp equipage, etc., on requisition; are entitled to the benefits of the homestead laws and of the government hospital for the insane; to pensions for wounds, injury, or disease; to artificial limbs or commutation therefor in certain cases; to credit for previous service in the volunteer army or navy; to share in prize-money and the salvage of recapture; to indemnity for loss of effects where vessel is sunk or destroyed (since April 19, 1861); and to pay and allowances of like grades in the infantry of the army, which is paid monthly by the paymaster of the corps while serving ashore, less 20 cents deducted for naval hospital fund. Officers receive mileage at 8 cents per mile, and the men 75 cents per diem when traveling without rations.

Officers enter at the foot of the list of second lieutenants,—appointed, usually from civil life, through political or personal influence,—are instructed at the headquarters of the corps in Washington, and thence distributed to posts; later they may attend the artillery and torpedo schools. Being combatants, they are, in reference to "line and staff," classed as line-officers, except the five who constitute the marine staff (adjutant, paymaster, quartermaster, and two assistant quartermasters); on shore, are subject to detail for all military duties, and on board ship either command the guard or serve as juniors with the commander; the senior is assigned the fourth room from forward on the port side, and the junior takes quarters according to his rank; when two or more are attached to same ship, one is required to be on board at all times for duty. By regulation the senior is required to report daily, in writing, to the commanding officer of the vessel the state of the guard; to keep the muster-rolls, and have charge and make returns of the clothing, arms, and other property belonging to the marines; to exercise them in the prescribed drills at such times and places as the commanding officer of the vessel may appoint; to be attentive to their comfort and cleanliness, as well as their soldier-like appearance and efficiency; to inspect the extra clothing once a month, and report its condition; to report his guard or division when mustered at quarters; to see that they are properly stationed and instructed as sentinels, and to frequently visit them at night. All general orders to sentinels must pass through him, and any misbehavior on guard or on duty as sentinels must be reported to him by the officer-of-the-deck. When serving on shore with sailors in mixed detachments, the marines are posted on the right without regard to the rank of the officers commanding companies. The senior marine officer of a squadron is known as the fleet marine officer. He organizes and inspects all the marines in the squadron, commands the guard of the flag-ship, and is usually the judge-advocate of the station. (See JUDGE-ADVOCATE.) A bill has been reported favorably in Congress to give this officer while so serving the rank and pay of major. Field-officers are not sent to sea. All company officers are on the sea-roster, which is kept by the commandant, and they are expected to go in regular turn. Three years constitutes a cruise and entitles to shore duty.

Non-commissioned officers correspond in grade to those of the army; are selected from the privates for character, bearing, and proficiency in drill; are examined in reading, writing, spelling, arithmetic, tactics, and duties, and when recommended by a board of at least two officers receive parchment warrants from the commandant, and can only be reduced by his authority or the sentence of a court-martial; vacancies occurring at sea may be filled by the commanding officer of the vessel upon the recommendation of the marine officer, provided the candidate be reported qualified by a board of three officers; if reduced the warrant is returned, but if honorably discharged it may be retained; upon re-enlisting within thirty days their rank is continuous; they recite tactics from time to time, and being borne on a general corps roster have many opportunities for promotion. Pay for 50 first sergeants is at present appropriated, some of whom are in charge of small guards. Their chevrons, or distinguishing marks of rank, are the same as in the army, but are worn inverted; the colors are orange on a scarlet ground.

Enlistments are for a period of five years; are not to be made on foreign stations, nor are men to be discharged except from a barracks; enlisted men receive same pay and bounty for re-enlisting as those of like grades in infantry; persons enlisted in the military service may, on application, be transferred by the President to the marine corps; the band receives $4 per month extra pay, each man, for playing on the Capitol grounds or the President's grounds; and all marines are entitled to one navy ration daily. Formerly the ration was prescribed for each day in the week, by law, with the liberal addition of "a half-pint of distilled spirits or one quart of beer daily." In old times marines were allowed to the revenue cutters, and in the regulations for the navy, enacted in 1798, are referred to as "marine soldiers." Enlistments were then made for one year, subject to extension or discharge by the President. In the primary legislation great

stress was laid upon the importance of both officers and men being "good seamen," or acquainted with maritime affairs. Now, while it is desirable that they should know something of the sea, it is not required and not advisable that they should be "good seamen." That would go far to neutralize their chief value as an element non-assimilating in the ship's complement. Credit is given to both officers and men for previous service in the volunteer army or navy, and as re-enlistment in either the army or marine corps within thirty days of honorable discharge entitles to increased pay for continuous service, men are frequently found in each who have served one or more enlistments in the other.

Recruits must be at least 5 feet 6 inches high, between 18 and 35 years of age, able to read and write, of steady habits, unmarried, well made, sound as to senses and limbs, and of good health. They enter voluntarily, undergo strict medical examination by a naval surgeon, and are attached to barracks for instruction before being sent to sea. The drill on shore embraces the schools of the soldier, company, and battalion, skirmishing, target-practice, the bayonet exercise, and all military duties and ceremonies. Afloat, this continues so far as may be practicable, and to it are added the great gun or artillery drill, and by some officers instruction in swimming, rowing, the signal code, and the broadsword. Upton's Tactics and the Ordnance Manual are employed, the former since 1867. Reports of drills and instructions are required to be made monthly; the commandant inspects each post (except Mare Island) annually, the adjutant does the same quarterly, and a captain, who is a member of the permanent Inspection Board, sees the guards of all ships sailing upon or returning from a three years' cruise. Boys over 14 are enlisted as apprentices to learn music, —the drum and trumpet,—and bandmen are enlisted and classed after examination at headquarters, Washington, where the band is permanently stationed. The regulations for the recruiting service of the army apply to the marine corps so far as practicable.

The arm in use at present is the Springfield (U. S.) rifle, calibre .45, and the knapsack, haversack, canteen, and rifle-sling are of the infantry pattern. Belts are of English buff leather worn white, and boxes black. Clothing, rations, quarters, fuel, medicines, and medical attendance are furnished by the government. The former, now made by the quartermaster's department in Philadelphia, is of excellent quality, and a careful soldier can save out of his allowance of clothing from \$75 to \$100 in five years, which is paid to him in cash on discharge. The ration is sufficient and substantial. The uniform (revised in 1876) is varied and elaborate. The full dress rather gaudy, but the rest neat and in good taste; caps and coats dark blue; trousers and overcoats sky-blue; trimmings for officers are scarlet and gold, for men scarlet and orange; musicians wear scarlet coats with white piping for full dress; fur hats and Arctic shoes are issued for winter, and white helmets and linen trousers for summer and the tropics. The cap device, formerly a bugle, has been since 1869 a metal hemisphere on an anchor and surmounted by an eagle. Blouses braided with black mohair were adopted for officers in 1870.

The discipline is based upon the laws and regulations for the government of the navy, which apply to them at all times, except when serving with the army (act June 30, 1834). (See COURTS-MARTIAL.) The military spirit is sedulously cultivated, and severe punishments seldom inflicted. Whenever a man is transferred, his character must accompany him, the words used being "excellent," "good," or "bad," and no others. This is entered upon his descriptive list, and on his final discharge. "Bad" on a discharge precludes re-enlistment. Intemperate and unreliable men are specially discharged upon recommendation of their commanding officers, accompanied by their records, as "unfit for the service." Drunkenness and desertion are decreasing each year. The sale of malt or spirituous liquors in barracks is forbidden, and enlisted men are not allowed to act as sutlers or sutler's agents, nor to trade with each other.

A marine detachment serving within a navy-yard is subject to the orders of the commandant of the yard, but no part is to be relieved or withdrawn except by order of the commandant of the marine corps, approved by the Secretary of the Navy. Officers joining such a detachment report first to the commandant of the yard, then to the officer commanding detachment. The latter is charged with the police, internal government, and instruction of the marines; causes guards and sentinels to be posted wherever required by the commandant of the yard, and makes a daily report to him of the number and disposition of the force under his command. He issues every morning, in writing and under seal, the countersign for the ensuing night; grants the customary liberty to the enlisted men; requires the daily rations and meals to be inspected and made to comply with the contract; reports misconduct on the part of the guards or sentinels to the commandant of the yard; enlists recruits, and forwards staff returns of men transferred; sees that the exercises and formations at parades, reviews, inspections, funerals, etc., and the camp and garrison duties, and the salutes, are the same as the army; requires a daily drill of one hour, and that officers and men in garrison wear the prescribed uniform.

Details of enlisted men for sea-service are made from rosters kept at each post, so that they may go in turn, unless they volunteer. Three years is the tour, at the expiration of which time they are relieved. Unless a ship is unpopular, there is generally a surplus of volunteers. Indifferent or unworthy men are not permitted to go. Guards for ships are made up at the nearest barracks, and march on board when the ship goes into commission fully organized, accompanied by their officers and ready for duty. They salute the flag when it is hoisted, salute it when it is hauled down at the end of the cruise, and are the last to leave the ship. They are entered separately on the books; are upon the same footing as seamen with regard to provisions; are furnished with certain articles of clothing and small stores by the paymaster when their commanding officer certifies that they require them; when not on guard or on duty as sentinels, are subject to the orders of the sea-officers in the same manner as the crew; are not to be diverted from their appropriate duties, nor called upon to coal ship or work as mechanics, except in cases of emergency;

are not to perform duty above the rail, unless to act as sharpshooters in the tops; may be assigned as parts of gun's crews in divisions other than their own; when sentinels, must receive orders through the sergeant or corporal of guard.

Their particular duties on board ship are, as sentinels to watch over the magazines, store-rooms, gangways, galleys, boats alongside, approaching, or passing, and all lights and fires required for the use of the ship, and to give the alarm in case of fire; to preserve order, and allow no swearing, gambling, or immoral practices; to prevent injury or theft of public or private property, or interruption of the cooking duties; to allow no smoking or washing except at the prescribed hours; to allow no enlisted man or boat to leave the ship without the authority of the officer-of-the-deck; to guard the ordinary prisoners and the prisoners of war, who sometimes outnumber the crew; and at all times to sustain discipline by their organization, distinctive character, and peculiar training. In port they constitute the deck guard, to render honors or assistance, and at sea they are (at least a large portion of them) always near their arms, to prevent surprise from without and check insubordination from within. In action, they man and fight a division of the spar-deck battery, fill vacancies at other guns, scour the enemy's decks from the tops, the poop, or forecastle with their rifles, cover the boarding-parties with their fire, and repel boarders with fixed bayonets. Should the enemy gain a foothold, they rally at the mainmast, so as to command the deck. In case of fire they guard the boat's falls and officers' quarters, prevent panic or pillage, compel compliance with the orders of the officers, and allow no one to throw overboard any property or fittings, or abandon the ship, until duly authorized.

In the landing-parties and boat expeditions they go thoroughly equipped, and are distributed among the several boats. In mixed operations on shore, such as the surprise of a camp or post, or the escalade of a fort, picked men are sent with the pioneers, and the rest form the supporting column, and in case of failure, cover the retreat and embarkation of the sailors. The venerable Senior Flag-Officer Stewart said of sailors: "They are a class whose onset and first efforts are tremendous and formidable, but if resisted and discomfited they break into groups, become a mere mob, and without a body of regular troops to sustain them must fall a sacrifice." A frequent duty abroad is to guard the American legations and consulates, and the interests of American citizens in times of revolution or public disorder, and to protect surveying and astronomical parties.

The present allowance of marines to ships varies with their class or rate. The old rule was a marine to each gun; but guns were then smaller and much more numerous. This table is generally used:

Vessel.	Rate.	Guns.	Displacement.	Captain.	Lieutenant.	Sergeants.	Corporals.	Music.	Privates.	Aggregate.
Colorado and class	1st	30	4700	1	1	3	4	2	40	51
Powhatan "	2d	14	3980	...	1	2	2	2	24	31
Lancaster "	"	22	3250	...	1	2	2	2	30	37
Alaska "	"	12	2400	...	1	2	2	2	20	27
Vandalia "	"	9	2200	...	1	2	2	2	20	27
Juniata "	3d	8	1900	...	1	2	2	2	20	27
Alliance "	"	6	1375	...	1	2	2	2	20	27
Kansas "	4th	3	900	...	...	1	...	2	10	13

Flag-ships are allowed 5 privates additional.

The following is a list of the commandants from the beginning, with their rank and date of commission or appointment:

Samuel Nichols, major, June 25, 1776.
William W. Burrows, lieutenant-colonel, May 1, 1800.
Franklin Wharton, lieutenant-colonel, March 7, 1804.
Anthony Gale, lieutenant-colonel, March 3, 1819.
Archibald Henderson, lieutenant-colonel, October 17, 1820; colonel, July 1, 1834; brevet brigadier-general, January 27, 1837.
John Harris, colonel, January 7, 1859.
Jacob Zeilin, colonel, June 10, 1864; brigadier-general, March 2, 1867.
Chas. G. McCawley, colonel, November 1, 1876.

Gen. Henderson died January 6, 1859, having served his country 53 years, of which 39 were in command of the corps. Col. Harris died May 12, 1864, having served 50 years, and 5 in command. Gen. Zeilin was on the active list 45 years, 12 years in command, and is living at this date (October 1, 1880) in Washington.—*Henry C. Cochrane, Captain U.S.M.C.*

Marine Corps of the Confederate States. Before the attack on Fort Sumter, the Confederate States began the organization of a marine corps, the first appointment bearing date March 25, 1861. Mr. Mallory, the Secretary of the Navy, cordially welcomed all seceders from the United States service, and generally gave them precedence over other appointees. The organization was that of an infantry regiment of 10 companies, numbering 1000 men, with a colonel commandant and three staff-officers with the rank of major. Its headquarters were in Richmond, and Major Lloyd J. Beall, who had been a paymaster in the U. S. army, and was an old friend and classmate at West Point of Mr. Jefferson Davis, the President of the Confederate States, was appointed commandant.

The principal command—four companies, under Capt. John D. Simms—was stationed during the war, when not engaged in expeditions, at Drury's Bluff, on James River, as a permanent garrison. When it was believed in Richmond that the Federal ironclads intended to force an entrance into Charleston harbor, Capt. Simms

was sent with 200 men to that point, where they were provided with liquid fire in bottles and then distributed among the different blockade-runners in port, with orders to board the ironclads upon their approach and pour the combustible into any apertures which might be accessible. The marines remained at Charleston about a month, and then returned to Drury's Bluff, which they held until Richmond was abandoned, and later were captured as a part of Ewell's corps, after a three hours' fight at Sailor's Creek, and sent to the prison camp at Johnson's Island.

Other companies served at the naval depots in Richmond, Savannah, and Mobile, at Pensacola and Norfolk until those places were captured, and at Fort Fisher. Capt. R. T. Thom commanded the marines of the "Merrimac" in the great fight with the fleet at Hampton Roads, and Lieut. B. K. Howell, a brother-in-law of the Confederate President, was on the privateer "Alabama" until she was destroyed. The marines of Tattnall's fleet, at the battle of Port Royal, were commanded by Capt. Geo. Holmes and Lieut. Raney, and the guard of the naval depot at Mobile by Capt. Meiere. Other officers were assigned to vessels in the river and harbor flotillas, and some were on duty with the armies. Capt. Tattnall was for a time colonel of an Alabama regiment, and Capt. Hays a lieutenant-colonel on the staff of Gen. Bragg. Lieut. Sayre was also with the army. Capts. Jacob Read and Geo. P. Turner were dismissed. Major Allison had been a purser in the U. S. navy.—*Henry C. Cochrane*, *Captain U.S M.C.*

Marine Corps, Foreign. Until the year 1664 the British navy was manned by means of the system of impress, or by enlisting landsmen ; but the commerce of England at that period was so limited that these measures were found inadequate to procure sufficient seamen for the public service, and this difficulty suggested the formation of marines. The men were raised with the object of forming a nursery to man the fleet, and being quartered in or near the principal seaports, their great utility in the equipment of squadrons soon made it desirable to augment their strength. The first order in council which has reference to this subject is dated the 16th of October, 1664, authorizing 1200 soldiers to be raised and formed into one regiment. From 1776 to 1784 the average strength of the royal marines amounted to 18,790 officers and men. In 1844 the total strength amounted to 10,469. The aggregate strength at the present time is 15,000 non-commissioned officers, musicians, and privates, and the following officers:

ARTILLERY—*General Officers.*—1 general, 1 lieutenant-general, and 2 major-generals.

LIGHT INFANTRY—*General Officers.*—2 generals, 2 lieutenant-generals, and 5 major-generals.

General Staff.—1 deputy adjutant-general, with rank of major-general, 1 quartermaster.

ARTILLERY—16 *Companies.*—1 colonel commandant, 1 colonel, 3 lieutenant-colonels, 40 captains, 47 lieutenants.

Staff.—1 staff-captain, 3 instructors of gunnery, 1 instructor of musketry, 1 adjutant, 1 military instructor, 4 quartermasters, 1 barrack-master, 1 paymaster, 1 staff-surgeon, 2 surgeons.

LIGHT INFANTRY—48 *Companies.*—3 colonels commandant, 5 colonels, 12 lieutenant-colonels, 111 captains, 146 lieutenants.

Staff.—3 instructors of gunnery, 4 instructors of musketry, 7 adjutants, 7 quartermasters, 4 paymasters, 4 barrack-masters, 1 deputy inspector-general of hospitals, 1 staff-surgeon, 6 surgeons.

The military education of the officers of the Royal Marine Artillery is thorough. The cadets are obliged to undergo a course of study for two years, during which they are expected to acquire a competent knowledge of arithmetic, algebra, geometry, plane trigonometry, the use of the sextant, fortifications, a practical course in naval gunnery, English history, and French. If, on obtaining his commission, the young officer is selected to qualify for the artillery, he must be prepared at the end of the year to pass an examination in analytical trigonometry, differential and integral calculus, conic sections, statics and dynamics, hydrostatics and steam. The men are volunteers from the light infantry divisions. The course of training is very comprehensive; it includes the usual infantry drills and musketry instructions, field guns and rockets, field-battery movements, the service of heavy ordnance; a laboratory, including use and preparation of tubes, rockets, and fuses, making up cartridges, the manufacture of port-fires, signal-lights, and rockets, and all matters connected with the theory of projectiles as may have a practical application.

The marines of Germany were selected, when organized, from the *élite* of the army, and that corps ranks next to the English marines in discipline and efficiency. Spain and Italy have, also, a large and well-disciplined force of marines. The organization of the French marines is considered the most important and efficient of the military forces. The duties of this corps are entirely confined, however, to the protection of dock-yards and arsenals, and to the occupation of forts on the sea-coast. Turkey, although occupying an unimportant position among the great naval powers, has organized a corps of marines which compares favorably with those of other countries.

It is a fact not generally known that a corps of marines existed in the Roman army, but it is, nevertheless, a fact; and also that a marine cohort was stationed in England. In Bruce's "History of the Roman Wall," which divided England from Scotland, the author states that, "In ascertaining the number and the names of the stations, a most valuable document has come down to our times from the period of the Roman occupation. The *Notitia Imperii* was, probably, written about the end of the reign of Theodosius the Younger, and was certainly composed before the Romans abandoned this island. It is a sort of list of the several military and civil officers and magistrates, both in the Eastern and Western Empires, and the places where they were stationed. It may, in fact, be regarded as the Army List of the Roman Empire." The portion of the section containing the information we quote is headed, *Item per Lineam Valli*,—"Along the line of wall,"—and after detailing 17 cohorts or wings of cohorts, with their stations, arrives at "The Tribune of the First Marine Cohort, styled Ælia, at Tunnocelum." Thus there was a first, and therefore a second, and possibly many other marine cohorts, in the Roman army.

Marine Hospital Service of the United States. This service dates its establishment from July 16, 1798, at which time an act for the relief of disabled and sick seamen was passed by Congress, after the subject had been before that body for several years. Hospital money had been collected in the colonies for nearly sixty years previous to the establishment of the service, so that Congress was undoubtedly familiar with the system. The first hospital exclusively for seamen was the magnificent naval hospital at Greenwich, England, commenced by Charles II., and ordered by Queen Mary to be completed "as a retreat for seamen disabled in the service of their country." The Royal Hospital for Seamen at Greenwich was built by order of King William soon after Queen Mary's death. By an act of Parliament passed in the second year of George the Third's reign, the seamen of the American colonies were obliged to contribute to the support of this hospital, and sixpence per month was the tax deducted from the wages of all seamen, English subjects, sailing to and from American ports. The Archives of Pennsylvania (vol. i. p. 251) show that four receivers, Richard Fitzwilliam and John Moore, Philadelphia, Alexander Keith, Newcastle, and Henry Brooke, Lewes, were appointed in 1729 for the province of Philadelphia. This example of the utility of marine hospitals had a marked effect upon the colonies, and as early as 1780 the Commonwealth of Virginia taxed all seamen and marines in the State the sum of ninepence per month as hospital money, and the naval officers were authorized to collect it, being allowed five per cent. commission on all moneys collected. In October, 1782, the tax was increased from ninepence to one shilling per month. December 20, 1787, Virginia passed a law establishing a marine hospital, and authorized the governor to appoint a commission to select a site in the town of Washington, Norfolk County, Va. In 1789 North Carolina enacted a law creating a hospital fund, and in 1790 the commissioners of the poor at the various ports of entry were appointed the collectors for this fund. The tax (per capita) was graded as follows: captains 5*s.*, mates 2*s.* 6*d.*, and each member of the crew 1*s.* 6*d.* A bill was presented to Congress on August 28, 1789, providing for the adoption of harbor regulations and the establishment of hospitals. The records of the Boston Marine Society show that they are entitled to the credit of presenting the first memorial to Congress on this subject, their petition praying for the establishment in the United States of three marine hospitals having been presented in the House January 27, 1791, but it was not until 1794 that any action was taken in regard to this or other petitions which had been presented to Congress, and the bill passed then was one providing for the aid of our seamen in foreign countries, and two resident agents, one for Great Britain and one for the West Indies, were appointed. In February, 1797, the committee appointed to inquire into the operation of the act for the protection and relief of American seamen, recommended the passage of resolutions fixing a tax on the wages of every seaman sailing from any United States port, and to the establishment of hospitals for the relief of disabled and sick seamen, but it did not become a law until the following July. The tax fixed by this law was 20 cents per month from the pay of all seamen. On March 2, 1799, an additional act passed Congress authorizing all moneys collected within any one State to be expended in such State; this, however, did not apply to the States of New Hampshire, Rhode Island, Connecticut, and Massachusetts, as they mutually supported the Charlestown, Mass., hospital. This act also taxed the officers, seamen, and marines of the navy, and entitled them to the benefits of the hospital fund.

The report of the Secretary of the Treasury on the condition of the service, dated February, 1802, shows that hospitals had been established at Boston, Newport, Norfolk, and Charleston, solely supported by funds raised under the authority of the United States; that the Baltimore hospital was under the control of the Board of Health, although supported by the United States; that the sick seamen of New York and Philadelphia were received in the city hospital, a fixed rate per week being paid for their care and treatment out of the marine hospital fund; and that at Portland, New London, Wilmington, N. C., Newbern, Edenton, and Alexandria, they were afforded temporary relief in private boarding-houses; that the total amount received from seamen, in public and private service, was $147,875.58, $6185.33 of which had been applied to the purchase of the Gosport hospital; $74,636.51 was the total cost for the relief and treatment of sick seamen, and $6707.87 was returned to agents who had expended more than they had collected, $73,761.61 remaining unexpended. In May, 1802, an act was passed, amending the act of 1797, by which the sum of $15,000 was appropriated for the erection of the Boston hospital; the moneys collected on account of the hospital tax were constituted a general fund; and the directors of the marine hospitals were to be held accountable for the moneys received, and also be allowed one per cent. commission on all moneys disbursed.

In 1803 the marine hospital at Charlestown, Mass., was built; the same year one was permanently established at New Orleans, and in 1804 the necessary equipments were furnished to this hospital. The Secretary's report of 1806 shows that contract physicians were employed at Newport, New London, and Baltimore, the only marine hospitals in operation at this time being at Boston and Norfolk; and that sick and disabled seamen were treated in the almshouses at Portsmouth, N. H., Portland, Me., Newport, R. I., and Alexandria, Va., and that at New York, Philadelphia, and New Orleans the local hospitals furnished the necessary relief. The amount of $55,649.29 was reported by the Secretary of the Treasury, February, 1811, as having been paid in, on account of the hospital fund. February 26, 1811, the law creating the naval hospital establishment and separating the naval fund, was passed. The following table shows the number of American seamen who received treatment and relief in the marine hospitals from 1796 to 1812:

1796	4,849	1805	10,722
1797	9,021	1806	9,900
1798	7,031	1807	7,937
1799	6,514	1808	1,121
1800	3,390	1809	9,170
1801	6,917	1810	3,668
1802	891	1811	4,828
1803	10,724	1812	3,252
1804	6,822		

In February, 1818, the hospital at Boston was partially destroyed by fire, and the new Boston marine hospital was not finally located until 1827, at Chelsea; in 1836 this and the hospitals at Norfolk and Charleston, S. C., were the only marine hospitals, and the last was not managed by the government, but under contract with the city authorities. On March 3, 1837, an act was passed appropriating $70,000 for the erection of the New Orleans marine hospital, $15,000 for three sites on the Mississippi and one on Lake Erie, and $10,000 for the erection of the Mobile hospital, and the sum of $150,000 was appropriated for the relief of seamen, and at the same time the tax of 20 cents per month on the wages of each seaman was suspended for one year; it was, however, a long time after the passage of this act to the date of the establishment of the marine hospitals along the Mississippi River and the Lakes, as the circumlocutory manner followed by the government caused innumerable delays; for example, the act authorizing the establishment of a hospital at Ocracoke, N. C., was approved August, 1842; the site was selected January, 1843; purchase sanctioned by the Secretary of the Treasury, April, 1844; title examined and made good by Attorney-General, May, 1844; the Department advised of the transfer by the State to the United States, January, 1845; proposals for building received in March, 1845; papers referred to the collector of customs at Ocracoke, May, 1845, and it was reported to the House that the building would cost $5497, and be finished in September, 1845, three years being required to select the site, purchase the ground, and erect a building which could have been completed with all its details in six months. The act passed March 1, 1843, extended the provisions and penalties of the service to the owners, masters, and seamen of registered vessels employed in the coast trade. The report of Drs. Edwards and Loring, who were appointed a board to inspect the hospitals then in operation and in process of construction, states that the condition, arrangement internally, and expense of the hospitals in operation vary with their number and location, and recommends that the hospital grounds and building at Chelsea be sold, a part of the naval tract purchased, and a new building be built thereon; that the hospital at Ocracoke be discontinued, and one at Wilmington be established, as the necessity for a hospital at this place was very urgent. The report also mentioned very favorably the hospital at Louisville, nearly completed, also the one at Pittsburgh; it favored a tonnage duty on all vessels, including fishing-vessels, and also recommended hospitals at Detroit, Buffalo, Cincinnati, and one or more ports in Maine; and also proposed to place the hospitals under the control of a "chief surgeon," who shall have his bureau attached to the Treasury Department. No action having been taken by Congress to secure proper uniformity in the marine hospitals, it is not surprising that the Secretary became disgusted, and reported, as he did, June 30, 1852, adversely to the erection of more marine hospitals. Secretary Cobb desired the abolition of the entire system, his report of June 30, 1858, showing astonishing discrepancies between the necessities of the case and the amount appropriated: "At Natchez, Miss., the hospital cost $53,250, and no return of patients admitted during the year had been received; at Portland, Me., the building constructed had cost $100,000, and only 61 patients had been relieved during the year, at an average cost of $3 per week; at Pensacola, 17 patients, at an average cost of $3.50 per week, had been medically treated."

In 1861 there were United States marine hospitals at Mobile, Ala.; Louisville, Ky.; Key West, Fla.; Galena, Ill.; Evansville, Ind.; Detroit, Mich.; Cleveland, O.; Chicago, Ill.; Charleston, S. C.; Cincinnati, O.; Burlington, Vt.; Chelsea, Mass.; Natchez, Miss.; Napoleon, Ark.; Norfolk, Va.; Burlington, Iowa; Wilmington, N. C.; San Francisco, Cal.; St. Marks, Fla.; St. Louis, Mo.; Portland, Me.; Pittsburgh, Pa.; Paducah, Ky., and Ocracoke, N. C. In March, 1862, Congress appropriated $200,000 for the marine hospital fund, and authorized the Secretary of the Treasury to sell the hospital at Burlington, Iowa, to use it for sick and wounded soldiers, or to close it, whichever he should deem the best for the interests of the government. During the war, owing to the sale or transfer of many American vessels abroad, the receipts from the marine hospital tax were lessened to a considerable extent; and to obviate this difficulty Congress enacted (April 29, 1864) that all hospital money that had become due should be collected by the agent or consul at the time of the transfer or sale of the vessel, and if not paid by the owner or master of the vessel, the transfer or sale was declared void. The hospitals at Charleston, S. C., Cincinnati, Ohio, and Burlington, Vt., were sold in 1866, and in 1867 the hospitals at Evansville, Ind., and Burlington, Iowa, and the hospital grounds at Paducah, Ky. (the building having been destroyed during the war), were sold, and the marine hospital at St. Marks, Fla., was transferred to the War Department. In 1868, the hospital at San Francisco was partially destroyed by an earthquake, and the one at Napoleon, Ark., was swept away by the river. In 1869, Dr. W. D. Stewart was appointed inspector of marine hospitals for the Treasury Department; he was succeeded by Dr. Billings, of the army. January, 1870, a bill reorganizing the service was submitted to the House by Secretary Boutwell. It provided for a systematic national service, and the regulations adopted in accordance with it provided for the examination of medical officers. Section 1 of the act of June 29, 1870, increased the hospital dues to 40 cents per month, and section 6 authorized the Secretary of the Treasury to appoint a surgeon to act as supervising surgeon of the Marine Hospital Service, which title was changed by the act of March 3, 1875, to supervising surgeon-general, and the office was made a Presidential appointment. Dr. John M. Woodworth, of Illinois, a distinguished surgeon during the war, was appointed supervising surgeon, March 23, 1871, and he was also the first supervising surgeon-general. In June, 1872, the contract system was abolished by act of Congress.

Since the reorganization of the service the annual reports show that all useless hospitals have been abandoned, the hospitals at San Francisco and Chicago have been completed, a system of dispensary relief inaugurated, and all medicines are purchased in bulk by the medical purveyor, who distributes them to the various hospitals. During the year ending June 30, 1873,

13,529 sick and disabled seamen were furnished medical and surgical relief; 12,697 seamen were maintained in the hospitals, and 832 others, not requiring hospital treatment, were relieved by furnishing them with medicines and appliances without admission. The following is the result obtained in the treatment of the 12,697 hospital patients:

Discharged cured	8,927
" improved	1,975
" not improved	161
Deserted while under treatment	108
Died	646
Remaining under treatment, June 30, 1873	880
Total	12,697

The average daily number of hospital patients throughout the year was 1151. The total cost of the service for the year, including everything, administration of the service, maintenance, care, and treatment of patients, and the medicines furnished them, expenses attending the burial of those who died, and the entire outfit of the new marine hospital at Chicago, was $422,502.98; the average cost of maintaining and treating each patient being $1.002 per day. The amount collected from seamen during the year was $335,845.95, an increase of $12,145 over the amount collected in 1872, and an increase of $47,700.53 over the amount collected in 1871.

Of the 31 hospitals built by the government since the organization of the service, there remained in use in 1873 ten, situated as follows: Chelsea, Mass.; Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; Louisville, Ky.; Mobile, Ala.; Pittsburgh, Pa.; Portland, Me.; St. Louis, Mo., and Key West, Fla. Of the remaining 21, fourteen had been sold, one transferred to the War Department, one abandoned, one burned, one destroyed by a flood, and one by a hurricane; one was injured by an earthquake and abandoned, and one remained unfinished, its completion being impracticable. There were also 81 ports where hospital relief was furnished to sick and disabled seamen in private or municipal hospitals at rates authorized by the Treasury Department.

During the year ending June 30, 1875, the seventy-seventh year of the operations of the service, and the fourth year of its reorganization on its present basis, its relief operations embraced 94 sea and inland ports of the United States, at which were relieved 15,009 sick and disabled seamen; 12,939 of these were treated in hospitals, and 2070 were relieved at the offices of the surgeons. The amount of hospital tax collected in 132 customs districts during the year amounted to $338,893.78, and the net expenditures out of the appropriation were $404,390.60. The legislation of the Forty-second Congress, in relation to the Marine Hospital Service, provided (1 and 2) for the collections of dues and the seamen's time-book; (3) definition of the term seaman; (4) lease of hospital buildings and grounds; (5) provision for insane seamen; (6) rate of charge for care of foreign seamen and of seamen belonging to the engineer corps of the army, the navy, the coast survey, and light-house service, and it is a noticeable fact that each of the above services has taken advantage of this provision, which is intended for their convenience and accommodation. From the establishment of the service in 1798 until 1873 appointments of medical officers were made without any preliminary examination. Since 1873 no appointments have been made except of such persons as have passed a good practical examination of professional qualifications. The new pavilion hospital at Mountain Lake, near San Francisco, which was commenced in June, 1874, was occupied in June, 1875, though not entirely finished. The aggregate cost of the hospital was $73,884.06. For the years 1876–77 the results attained were particularly gratifying, as within the fiscal year ended June 30, 1877, the collections of the hospital-dues amounted to $372,465.70, while the expenditures amounted to $368,395.28, showing a surplus of receipts over expenditures of $4070.42. During this year 15,175 seamen (10,975 in hospitals and 4200 office patients) were relieved by the service,—the average cost, $24.22 for each patient, being the lowest ever reached. March 14, 1879, Dr. Woodworth, the first supervising surgeon-general, having died, the present incumbent, Dr. John B. Hamilton, at that time a surgeon, was promoted to fill the vacancy. The officers of this service are of five grades, viz., supervising surgeon-general, medical purveyor, surgeons, passed assistant surgeons, and assistant surgeons. These are designated medical officers. At ports where the service is not large enough to warrant the assignment of a regular officer a resident physician is appointed as acting assistant surgeon. During the fiscal year ended June 30, 1879, 20,922 seamen (11,499 hospital and 9423 dispensary patients) were furnished relief by the service. The receipts were $361,409.58, and the expenditures $375,164,01, and the per capita cost was reduced from $24.22 in 1877, and $20.04 in 1878, to $17.93 for 1879. The steadily increasing number of patients treated by this service is abundant proof of its able management and the high esteem with which it is regarded by all of our sea-faring population, and it is also gratifying to add that it is meeting with the attention at the hands of Congress and commercial interests throughout the country that its object, character, and growing importance demand. The annual report for the fiscal year ending June 30, 1880, shows that while the 11,356 patients treated in 1869 cost $406,089, the 24,860 sick seamen relieved this year cost only $402,185, and the per capita cost has been still further reduced from $17.93 in 1879 to $16.18 in 1880. These gratifying results are attributed chiefly to the fact that the appointment of the medical officers of the service, upon whose professional skill, fitness, and faithfulness its character and conduct of course largely depend, have been removed from the influence of politics. The service is also now giving special attention to the physical examination of seamen. The medical officers of the service now examine without fee the crews of all vessels whose owners request it, and the adoption of this method of examination by all vessel-owners and masters will naturally result in the crews of American vessels attaining a high rate of physical ability.

Marine Insurance is a contract whereby one party, for a consideration or premium, which is usually paid in money, either in one sum or at different times during the continuance of the risk, undertakes to indemnify the other against certain perils or sea risks, to which his ship, freight, or cargo, or some of them, may be ex-

posed during a certain voyage or for a fixed period of time.

The party who takes the risk upon himself, or who undertakes to indemnify, is called the assurer, insurer, or underwriter (the latter term growing out of the practice of his subscribing his name at the bottom of the contract); the party protected by the contract, the assured or insured; and the money paid as the price of the indemnity, the premium. The contract itself, or, rather, the written instrument evidencing it, is called a policy of insurance. In England, continental Europe, and in most of the States of the United States, statutory enactments render it imperative that the contract should be reduced to writing; but in the absence of such statutes the contract is not invalid by reason of its having been made by word of mouth.

Printed forms of policies are now almost universally used. There are six essential parts to every policy,—

1. The parties.
2. The premium.
3. The subject insured.
4. Amount insured.
5. The risks.
6. The voyage or terms of the risk.

When the insurance is on a voyage from one port to another, without reference to time, the policy is called a *voyage* policy; but when it is from one fixed period to another, or for so many months, it is called a *time* policy.

When the value of the property insured—as between the assured and the underwriter—is expressed on the face of the policy, the policy is called a *valued* policy. When it is not so expressed, but is left to be estimated in case of loss, the policy is called an *open* policy.

The contract requires the most perfect good faith. If the insured makes false representations to the underwriter in order to procure his insurance on better terms, it will avoid the contract, though the loss arose from a cause unconnected with the misrepresentation or concealment.

For further information recourse to the following authorities is suggested: Marshall on Insurance, Duer on Insurance, Pardessus on Insurance, Flanders on Insurance, Addison on Contracts, Kent's Commentaries.—*Theodore M. Etting.*

Marine Rams. From the earliest history of man afloat the marine ram was a weapon of war, until improvements in the use of sails and the increased size of vessels made mere muscular exertion impotent, however many men might be employed in rowing. It must not be supposed that sails were not in use in those long periods of time during which the waters of the Mediterranean bore those exponents of naval power of many succeeding nations and peoples. Sails transported them over long distances, but the effective use of a vessel in ramming can exist only when her course can be changed at will, quite independent of the direction of the wind. Yet seamen in the olden time watched their opportunity, when vessels were engaged under sail, to "run down" an adversary. Blows thus delivered were sometimes effective, but if not, when once in contact, it became a hand-to-hand affair, known in modern times as "carrying a vessel by boarding." The invention of gunpowder, until steam became a motor, made the act of ramming almost obsolete, inasmuch as the attempt would expose the vessel to a "raking fire" of the enemy. As soon as the use of steam was established a power existed quite obedient to the action of the helm; the course was no longer dependent upon the direction of the wind. In force, too, and continued exertion, the propelling power as compared with oars was gigantic.

Able naval men were not slow to recognize again the marine ram as a powerful weapon, as will be seen by examining a model at the Naval Academy at Annapolis, made by Capt. Samuel Barron, U.S.N., in 1827. Years passed, however, before steam became the usual motor of vessels of war; until that period arrived no vessel designed for ramming was built, and even then ramming was regarded simply as an additional force to a gun-power, nor has it passed yet in public acceptation beyond that relation. With those accustomed to the use of ordnance, having a heavy gun available means almost the certainty of using it when an enemy is near. The loud noise, the unmistakable exhibition of force, and the clouds of smoke when the gun is discharged, all tend to give prominence and support to such action. It may be inferred that so long as a marine ram is armed with a gun, so long will its superior power be subordinated to a secondary place as a means of attack.

Heretofore the ram has been combined with a gun or torpedo, and sometimes with both; vessels have been called rams because of different constructions of the bow, in some cases entailing liability to its own destruction, as in striking a vessel having fair headway, moving at right angles to her course. The "Amazon" and the "Stonewall," built in 1864, are of this description. The first named, by accident, ran into a small vessel and sank immediately. The projection, or "snout," of those vessels extended some twenty feet forward from the upper part of the stem, forming an easy curve from it to the line of the keel.

The French constructed the first ram of this description, called the "Taureau," in 1863. Her dimensions were the same as the five other vessels of their navy called rams; her armament, however, was different; she had one 18-ton gun in lieu of the two 12-ton guns carried by the other vessels, which will be mentioned hereafter. The "Taureau" is no longer designated as a ram, but is put down for coast defense. The danger to a ram so constructed is so well recognized now that even what is known as a "spur" projects little beyond the upper part of the stem. A false bow, attached and detached at will, is now fitted by the English, which striking a vessel becomes detached. Only two vessels now completed, in the English navy, are designated as rams,—the "Rupert," 250 feet long, having a displacement of 5358 tons, with an armament of two 18-ton guns, and the "Hotspur," 235 feet long, with a displacement of 4012 tons, and an armament of one gun of 25 tons weight.

The Italians followed the construction of the "Taureau," completing the ram "Affondatore," which was regarded as a very formidable vessel, just before the battle of Lissa, in 1866. Her armament was two 9-inch Armstrong guns. It is stated that her steering-gear and speed were defective; her history during that battle was disastrous, and since has been unsatisfactory. Her

length is 290 feet, draft 20 feet, and displacement 4070 tons.

The "Belier" was the first of a class of five vessels in the French navy not unlike the "Taureau," except in a reduced prolongation of bow. Their length is 216 feet, draft 17 feet, and displacement 3313 tons, armament as stated before, two 12-ton guns.

The "Polyphemus," now nearly completed for the English navy, has a spur of considerable length, and a tube fitted in it to discharge a torpedo; her length is 240 feet, draft 20 feet, and displacement 2640 tons. A peculiarity of the model is that the keel of the fore body of the vessel is not straight, but rises 12½ feet to the "spur," which is 7 feet below the water-line and 7 feet in advance of the upper part of the stem. The frame and armor-plating are of steel; the crown of the armored part is 6 feet above the water-line. There is a false bow built over the armored shell, which would of course be destroyed in ramming a vessel. The "spur" is of such length and form as to make it liable to be carried away in ramming on the beam of a vessel having good headway. If not sunk from injury sustained, the ram will owe her preservation to well-constructed water-tight bulk-heads, and could be of no further use until repaired. She is built on a transverse frame with intercostals called girders, which must be regarded as a very imperfect development of the girder or longitudinal system of construction. The design is that the hull should present as little perpendicular surface as possible to the destructive effect of projectiles discharged from heavy guns, but the purpose does not seem to be satisfactorily carried out. A supposed speed of 17 miles is reckoned upon. Twin-screws are employed for propulsion.

A marine ram designed by a navy officer of the United States was presented for the examination and suggestions of a chief constructor of the navy, whose recommendations were adopted and the plans and specifications presented to the Navy Department. The length of the proposed ram is 200 feet, beam—including sponsons of 3 feet width—36 feet, draft 14 feet, and displacement 1600 tons, the propulsion to be effected either by twin-screws or the Mallory propeller. The amidship cross-section of the vessel is composed of semi-ellipses of 7 and 9 feet semi-conjugates, the latter being the lower section; the plating over the sponsoning forms sharp edges, which are 2 feet below the deep load-line, the steel plating being at that line 6 inches thick, and diminishing towards the crown of the arched deck to 1½ inches over an oak deck, and on the lower section reduced in thickness and riveted to the hull just below the sponsoning. The longitudinal lines are nearly straight for 100 feet, then curves of a parabola towards the ends forming a jointure on the plane of the two ellipses. A pilot-house of heavy steel blocks is designed to inclose the smoke-stack and the steering apparatus; horizontal and angular slits between some of the blocks give a fair sight to direct the movements of the vessel. She is designed to be constructed on 20 girders and a transverse frame to give them a lateral support. In the bow, the girders are bolted in pairs on opposite sides of flanges cast on a steel head, which has a core into which a steel punch is placed, and which projects 2 feet beyond the head. A water-tight skin incloses the frame; two longitudinal bulk-heads are placed far enough from the sides to permit a man to pass, and transverse bulk-heads are placed at distances apart equal to the distance between the floor and the girders above. No armament is proposed except Gatling-guns and small-arms to repel boarders.

The form of the vessel and her construction give her fore body great lateral strength. It is supposed no danger would occur in striking a vessel having a high rate of speed, the sponsoning and steel knife edge of the plating being intended to crush in abaft and rip out forward of the point of impact on an enemy.

The lines of the ram present above the water-line strong re-entering curves, so that the course of a shot striking at the water-line would, if not fired from a distance or from a considerable elevation, vary only 23 degrees from a line tangent to the plating, and diminishing towards the crown, at which its course would be practically tangent. The estimated cost of this vessel is about one-seventh of such armor-plated vessels as she would be expected to attack and destroy.

In considering elements of strength resulting from position it is worth while to consider the anatomy of the sword-fish, a marine ram fashioned by nature. We observe that the flat part of the sword is placed at right angles to an imaginary plane passing through the spine, and that if it pierced the side of an enemy which was moving rapidly, the edges of the "sword" would present the most favorable conditions for ripping itself out, and at the same time the greatest lateral strength of the "sword" would be utilized. The old rams before mentioned are unlike the sword-fish in the placement of the "snout" to the line of keel; the American ram, as designed, has the lateral strength of bow analogous to the anatomy of the sword-fish referred to, or nature's marine ram.

Naval men and others who are not favorably disposed towards the building of marine rams are pleased to assign them some office in a fleet engagement between armor-plated ships. Those who regard rams as capable of destroying fleets of armor-plated, gun-bearing ships propose to meet the latter in fleets, vessel for vessel, or more probably employing two or three rams on each vessel of the fleet and destroying them in detail. Really, the question is whether a given amount of money spent in building marine rams of the best design would not prove more economical than building armor-plated, gun-bearing ships.

No marine ram has yet been constructed which embodies the idea of looking to her striking force as the single element to be employed; until that is done the question naturally is problematical. It can only be solved through a practical development of the best physical conditions to obtain:

1st. Great speed and facility of manœuvre.

2d. Great strength of construction, so that the blows delivered would be diffused throughout the mass of the ram, and if the bows of the ram enter the hull of an enemy even 20 feet or more, that, however great the velocity may be of the vessel struck, the lateral strength of the ram may be sufficient to insure immunity from serious injury, not to say destruction.

3d. A pilot-house that is capable of resisting any projectile known, and provided with suitable arrangements to secure a proper vision.

4th. An impenetrable armor-plated hull of varying thickness, depending upon the angle it presents as a target for the fire of an enemy.—*Daniel Ammen*, *Rear-Admiral U.S.N.*

Marine Steam-boiler. A form of steam-boiler adapted to use on shipboard. It is composed of an exterior shell or casing, either of a perfect cylindrical form, or with rectangular sides stayed together by tie-bars, or of a combination of both, as in the locomotive boiler, within which are contained the furnaces, flues or tubes, connections, and, generally, the ash-pits; the whole surface exposed to fire being surrounded by water, except the furnace-front, and even this is sometimes partially closed by a water-space, leaving only the area required for the furnace-door opening and the front of the ash-pits. In modern practice the water-front has been abandoned, and it is customary to cover the furnace-front by a perforated plate of iron, shielded from the intensity of the flame by an inner plate also perforated, for the purpose of admitting the air required for the complete combustion of the imperfectly combined gases after they have left the bed of coals; the furnace-doors are also perforated. The quantity of air thus admitted should be about three-tenths of that required for the perfect combustion of the fuel. "Water bottoms" of the ash-pits of flat-bottomed boilers, which are useful only as a protection from fire, are a source of great trouble and expense, and their use has been abandoned in iron ships. The flues or tubes may be variously arranged, the usual method being to place them above the furnaces, thereby returning the gases from the back connection or combustion-chamber to the front of the boiler, where they are discharged through the uptake into a common chimney; but they are sometimes placed so as to return at the sides of the furnaces, or, as in the locomotive boiler, extended beyond the furnace, in which case the flame passes directly to the chimney without change of direction. "Man-holes," of such size as to readily admit the body of a man for the purpose of cleaning and repairing, are provided in convenient positions; and "hand-holes," for removing scale and sediment, are placed at and near the bottom. These holes are covered by elliptical or triangular plates fitted from the inside, so that the steam-pressure has a tendency to tighten them.

The principal attachments to marine boilers are safety-valves, which automatically release the steam when the pressure exceeds a stated amount; steam-gauges for indicating the steam-pressure; stop-valves, which admit steam to the engine steam-pipe; feed check-valves for supplying the boiler with water; water-gauges for ascertaining the height of the water; salinometer-pots for determining the density of the water; reverse-valves for relieving the boiler from outward pressure when the steam-pressure falls below that of the atmosphere; blow-valves or cocks, connected with pipes passing through the bottom or sides of the vessel, for discharging the brine or super-salted water, or clearing the boiler of water altogether.

The number of boilers in a steamship varies from two to ten, depending upon the power required and the design of the boiler.

The cylindrical boiler is in universal use when compound engines are used, or when high pressure is required. The ends and back connections are the only parts requiring stays, the furnaces being cylindrical, and the whole structure is easily accessible for operations pertaining to cleaning, preservation, and repairs inside and out; and, although it occupies on the floor of the hold of the vessel more room than the rectangular-faced boiler, it will probably be the model type for many years to come. Boilers with vertical water-tubes are obsolete.

In the most successful marine boilers of the present day, the water surface exposed to the fire is not less than $1\frac{1}{2}$ square feet for one pound of coal consumed per hour; the diameter of the tubes not less than $3\frac{1}{2}$ inches, and their aggregate cross-sectional area not less than $\frac{1}{7}$ of the area of the grates. Such proportions will admit of a combustion of 20 pounds of semi-bituminous coal on each square foot of grate per hour, and will give an evaporation of about 9 pounds of water for each pound of coal. In the steamship "Gallia," of the Cunard line, about $9\frac{3}{4}$ horse-power was developed for each square foot of grate.—*Albert Aston*, *Chief Engineer U.S.N.*

Marine Steam-engine. A form of condensing steam-engine adapted to use on shipboard. The principal objects to be attained in the modification of the land engine to suit the changes of condition are, compactness, because the machinery necessarily occupies a portion of the most valuable space in the vessel; minimum weight consistent with proper strength; ready accessibility to all parts, and such structural arrangement that all the stress due to the power exerted, except the resultant thrust tending to move the vessel through the water, shall be supported within the machine itself without depending upon the vessel's hull as a foundation. Two or more cylinders, with their pistons connected with cranks placed at such angles as to enable the machinery to be started from any position, are generally adopted, though there are cases where single engines are in use. The two distinct classes of marine engines are the "screw-propeller engine" and the "paddle-wheel engine," the former having superseded the latter for all purposes except river or other light-draft navigation.

The types of engines best adapted to paddle-wheels are the "oscillating engine," the "direct-acting inclined" engine, and, for river service, the "American beam-engine." Side-lever engines are obsolete. For screw-propellers, "direct-acting," or "back-acting" engines, working either horizontally, inclined, or vertically, are in general use. The term "direct-acting" implies that the connecting-rod is extended *from* the cylinder to the crank, and "back-acting" that it returns *towards* the cylinder, immediately at the end of which the crank revolves. Oscillating engines are not adapted to screw propulsion, for the constantly varying moment of inertia of the principal moving parts, caused by the rapid transition of the piston and its attachments from one end of the stroke to the other, tends to create an abnormal stress that no mechanism can sustain; and the valve-gear is necessarily inconveniently complicated. Trunk-engines, and engines geared to the screw-shaft by cog-wheels, are no longer designed by modern engineers, the principal objections to the former being the inaccessibility of important parts and the loss in economic effect due to the radiating and friction-producing sur-

face of the trunk, and to the latter their excessive weight and lack of compactness.

In unarmored vessels of war it is essential that the machinery should be placed below the draft water-line of the vessel, to avoid danger from the shot of an enemy, therefore the cylinders are placed in a horizontal position, or with their axes slightly inclined thereto; but in vessels of the commercial marine, and armored vessels of war, modern experience has demonstrated that the "inverted cylinder" type, in which the cylinders are situated over the cranks, with their axes vertical, is the most successful arrangement. In this form, the friction and consequent wear due to the weight of the reciprocating parts is avoided, and the alignment of the machine readily preserved. These remarks are applicable whether the engines be single or double, plain or compound.

Surface-condensers are now considered indispensable to marine service. Although much heavier and more costly than jet-condensers, the economy due to restricting the use of salt water in boilers fully justifies their adoption. See CONDENSER.

Compound engines are growing into universal favor. They permit the expansion of steam to its utmost beneficial limit without the use of complicated machinery, and high-pressure steam can be used without subjecting the machinery to undue strains therefrom. Their great economy in the use of fuel is but little doubted. See COMPOUND ENGINE.

Vessels of war are frequently propelled by two screws, or "twin-screws," in which cases two independent sets of engines are provided. The principal object of this arrangement, which is accomplished by driving one screw ahead and the other back, is to secure facility in turning a vessel,—a quality of extreme importance in rams or vessels designed to fight "end-on." Twin-screws are also advantageous on light-draft vessels when a single screw of suitable diameter cannot be properly submerged. The weight, and space occupied by machinery, is, however, somewhat increased.

There is a great variety of types of steam-engine adapted to marine service, but the above mentioned include most of those in general use. —*Albert Aston*, *Chief Engineer U.S.N.*

Mariner. A sea-faring man of whatever rank. In early days the term *mariner* was confined to experienced seamen.

MARINER'S COMPASS. See COMPASS, THE MARINER'S.

Maritime. Bordering on, or situated near, the ocean. Pertaining to those who, or that which, border on the ocean. Relating to navigation and naval affairs. In some senses synonymous with *marine*.

MARITIME COUNTRY. A country bordering upon the sea.

MARITIME INTEREST. See BOTTOMRY.

MARITIME POWER. A state which possesses seaports and a navy to protect them.

Maritime Law is that system of jurisprudence which prevails in courts having jurisdiction of maritime causes.

It differs materially from both the civil and the common law in origin, history, and principles, unlike either it is not the outgrowth of the wants of any one nation, nor is it mainly the product of any one mind, nor is it the embodiment of the learning of any one age or of any one people, but it is, on the contrary, the result of the necessities of all, of a necessity experienced by each at a certain stage in its national development, and which, by reason of the universality and inherent justice of its principles, has so commended itself as to lead to its universal adoption.

It is founded on the practices of merchants, the principles of the civil law, approved compilations of maritime rights and usages, the writings of eminent authorities, and the adjudications of the admiralty courts of different countries. It is to the wants of commerce that maritime law owes its origin.

Rhodes was its birthplace, the Mediterranean its nursery, 900 years B.C. The inhabitants of this little island, then the centre of a flourishing commerce, gave to the world its first maritime code. The Rhodian code was subsequently adopted by the Romans, and was incorporated in the Pandects, and thus became the basis of maritime law as known to the ancients.

With the disruption of the Roman empire commerce almost entirely disappeared; and for some years the history of maritime law is buried in oblivion. With the revival of commerce came the re-establishment of consular courts, and the necessity for a system of jurisprudence by which to govern their decrees. The subsequent occurrence of the Crusades and the discovery of the compass gave to commerce an impetus far surpassing any which it had hitherto possessed. And this it was that gave rise to the maritime law of the Middle Ages.

Various maritime codes were promulgated in different parts of Europe, the Consolato del Mare, the laws of Oleron, the laws of Wisbuy, and the maritime ordinances of the Hanseatic League being those most worthy of note. The precise date of publication as well as the authorship of these various codes is doubtful. The question, however, is mainly of antiquarian interest. The laws of Oleron found their way to England in the time of Richard I., and formed the basis on which were decided the earliest cases in the High Court of Admiralty, and even during the present century, in the American courts, decisions have been based on the same authority.

The most noticeable of the maritime ordinances of modern times have been promulgated in France. The Ordinance de Marine, promulgated during the reign of Louis XIV., forms one of the most lasting monuments erected to the memory of that monarch.

Codes have continued to form the basis of the maritime law of continental Europe. Such, however, has not been the case with regard to either England or the United States; though there are points of divergence between the American and English maritime law, yet they are both based, not upon a code, but upon the custom of merchants, upon generally received authorities on maritime law, statutory enactments, and upon precedents established by judicial decisions.

Maritime law is a branch both of international and of commercial law. It is included in the former because it defines the rights, duties, and obligations of nations with respect to each other on the sea; it forms a part of the latter because

of the protection which it gives to individuals engaged in commerce, both as to their person and their property, whether the wrong be one sounding in tort or in contract; it defines the reciprocal rights and obligations of owners and masters, of masters and mariners, gives an adequate remedy to those engaged in supplying the necessities of ships, governs questions of salvage, general average, marine insurance, charter-parties, contracts of affreightment, etc.

For further information refer to Kent's Commentaries, Flanders's Maritime Law, Parsons's Admiralty and Shipping, Abbott on Shipping, Etting on Admiralty Jurisdiction in United States.—*Theodore M. Etting.*

Mark. Any object serving for the guidance of a ship; as, *sea-marks, land-marks*, etc. *Square-marks, sharp-up marks*, bits of twine on braces, lifts, etc., to serve as a guide in bracing, topping up, etc. In marking the lead-line the second, third, fifth, seventh, tenth, thirteenth, fifteenth, seventeenth, and twentieth fathoms are designated by bits of leather and differently-colored bunting. These divisions are called *marks;* the intermediate fathoms are estimated by the leadsman, and are called *deeps*, and in sounding the leadsman gives the result by singing out *by the mark*, 5, 7, 10, etc., or *by the deep*, 6, 8, 11, etc. The two expressions serve to distinguish the soundings even when the numeral part of it is not distinctly heard. The two expressions may be rendered more dissimilar by using *be* when the sounding given is a deep, and *by* when it is a mark; as, "*by* the mark," "*be* the deep." See LEAD.

MARKS AND DEEPS. When a youngster goes on board ship he is first taught the lead of the ropes, boxing the compass, and the *marks and deeps* of the lead-line. "To learn the ropes" and "to learn the marks and deeps" have become expressions signifying to become familiar with the fundamental principles of any subject, or with the inside working of any scheme or project.

Markab. The bright star *α Pegasi.*

Marl. To wind marline, spun-yarn, etc., around a rope, each turn being secured by a peculiar hitch; commonly done to secure the parcelling preparatory to serving.

MARLINE. Fine seizing-stuff, consisting of two yarns laid up left-handed; it is also used for serving.

MARLING-HITCH. A jamming half-hitch, in which the hauling part comes out underneath the standing part; used in marling down parcelling and in lashing up hammocks.

MARLING-SPIKE, or MARLINE-SPIKE. A pointed iron implement used to separate the strands in splicing, and as a lever in marling, putting on seizings, etc.

MARLING-SPIKE HITCH. A peculiar hitch through which the marling-spike is put in heaving taut a seizing.

Maroon. A name given in Jamaica and Dutch Guiana to a runaway slave. The term was first applied to slaves deserted by their masters, the Spaniards, when the British conquered Jamaica (1655).

MAROONING. A custom among former pirates of putting an offender on shore on some desolate cape or island, with a gun, a few shot, a flask of powder, and a bottle of water.

Marque, Letter of. See LETTER OF MARQUE.

Marquette, Jacques, one of the first explorers of the Mississippi. Born at Laon, France, in 1637; died May 18, 1675. Becoming a Jesuit at the age of 17, he sailed for Canada as a missionary in 1666. After passing about eighteen months at Three Rivers, in April, 1668, he founded at Lake Superior the mission of Sault Ste. Marie. In 1699, after a short stay at Lapointe, he followed the Hurons to Mackinaw, where, in 1671, he built a chapel at the mission of St. Ignatius, or Michilimacinac. In May, 1673, he accompanied Jolliet's expedition to explore the Mississippi, and after traveling in canoes over 2500 miles, returned in September. They proceeded to Green Bay, through Fox River to the Wisconsin, and thence by Portage to the Mississippi, which they descended to the Arkansas. Returning they ascended the Illinois, proceeded thence across to Lake Michigan and Green Bay, and to the mission without serious accident. During this expedition he prepared a map of the route. Having promised the Kaskaskia Indians to return and preach to them, after being detained a year by sickness, he set out in October, 1674, with two white men and a number of savages, for the village of Kaskaskia. After wintering at the Portage in the Chicago, he reached Kaskaskia, April 8, 1675, and at once began a mission by erecting an altar and celebrating the festival of Easter; but conscious that his end was approaching, he soon attempted to return to Mackinaw, but died near the mouth of a river on the east shore of Lake Michigan, which still bears his name. He was of a cheerful, joyous disposition, playful even in his manner, and universally beloved. His narrative was published at Paris in 1681, in Thevenot's "Recueil de Voyages." This account, as well as a journal of the missionary's last expedition, is in Shea's "Discovery and Exploration of the Mississippi Valley," New York, 1852.

Marrot. A name for the guillemot.

Marry. To place two ropes alongside of each other that both may be grasped and hauled on at the same time. To join two ropes end to end so both will pass through a block, as in reeving a new brace by the old one.

Marryat, Captain Frederick, R.N., an English novelist. Born in London, July 10, 1792; died August 2, 1848. His mother was the daughter of Frederick Geyer, of Boston. Entering the navy at an early age, he distinguished himself in several engagements, particularly in 1814, by cutting out four vessels in Boston Bay, and in an action with gunboats on Lake Pontchartrain. He also benefited the naval profession by the invention of his well-known code of signals. He commenced his literary career in 1829, producing a great number of sea-tales, among the best of which are "Peter Simple," "Midshipman Easy," "Percival Keene," etc. In 1837 he visited the United States, and on his return published his "Diary in America," which reflected somewhat severely on our national characteristics. This was followed by three additional volumes, and by his "Travels of M. Violet," supposed to be founded on the adventures of Chateaubriand in the woods of the New World.

Mars. The superior planet coming next in position to the earth. Mean distance from the sun, 145 millions of miles; diameter, 4500 miles;

apparent diameter, 4″ to 24″. Mars is distinguished by its red, fiery appearance. Symbol ♂, representing a shield and a spear.

Marsala, on the west coast of Sicily, is a strongly fortified seaport town inclosed by bastioned walls. Its ancient port was filled up in 1580 by Don John of Austria, and it now has an artificial port. Its importance is due to its wine trade, the district yielding annually about 30,000 pipes of wine, two-thirds of which are exported. It also exports corn, cattle, oil, salt, and soda. Pop. 34,000.

Marseilles, the most important seaport of France, is situated at the head of a finely sheltered bay, on the Gulf of Lyons, in lat. 43° 17′ 48″ N., lon. 5° 22′ 15″ E. It possesses a naval observatory, maritime syndicate, a first-class school of hydrography, a special school of commerce and industry, and many other institutions of importance. The harbor is one of the finest in France, perfectly secure in all weathers, with good anchorage for 1200 vessels in from 18 to 24 feet of water. It is strongly defended by two forts, the Tower of St. John and Fort St. Nicholas. Its foreign commerce exceeds that of every other port in France, and extends to all parts of the world. Pop. 318,000.

Marsiliana. A square-sterned Venetian ship of burden.

Marston, John, Commodore U.S.N. Born February 26, 1796. Entered the navy as midshipman, April 15, 1813; served on board the frigate "President," Commodore John Rodgers; "Washington," 74, Commodore Isaac Chauncey; frigate "Java," Commodore O. H. Perry; brig "Prometheus," Capt. Alexander S. Wadsworth; brig "Prometheus," Capt. William Bolton Finch; frigate "Constellation," Commodore Charles Morris; frigate "Constitution," Commodore Jacob Jones; frigate "Congress," Commodore James Biddle; frigate "Brandywine," Commodore Charles Morris, when she took La Fayette to France, and afterwards in the Mediterranean; frigate "Brandywine," Commodore Jacob Jones, in the Pacific Ocean; schooner "Dolphin," Capt. John H. Aulick; sloop "Vandalia," Commodore John D. Henley; frigate "United States," Commodore Lawrence Kearney; frigate "Potomac," Capt. George W. Storer; sloop "Yorktown"; sloop "Cumberland," at the bombardment of Hatteras; steam-frigate "Roanoke,"—commanded at Hampton Roads in that ship when the "Merrimac" came down from Norfolk, Va.; in addition to this, a variety of service performed at the Portsmouth and Philadelphia Navy-Yards.

Promoted from a midshipman, July 13, 1825, to a lieutenant.

Promoted from a lieutenant to a commander, September 8, 1841.

Promoted from a commander to a captain, September 14, 1855.

Promoted from a captain to a commodore, July 16, 1862.

Retired December 21, 1861.

Martello Towers. So named from a tower in the bay of Mortella, in Corsica, which, in 1794, maintained a very determined resistance against the English. A martello tower is built circular, with walls of vast thickness, pierced by loop-holes, and the bomb-proof roof is armed with one heavy traversing gun. They are 30 to 40 feet high, surrounded by a dry fosse, and the entrance is by a ladder at a door several feet from the ground. The following is also given as the origin of the name: "When piracy was common in the Mediterranean, and pirates made plundering descents upon the coasts, the Italians built towers near the sea, in order to keep watch and give warning if a piratical craft was seen to approach the land. The warning was given by striking a bell with a hammer; hence these towers were called *Torri da Martello.*"

Martial Law. Anciently, in England, this term meant the law military. It was not a fixed and permanent code, but a body of regulations which the king, preparatory to actual war, composed, with the advice of the constable and marshal, who were high ministerial officers of the king, and which was administered by the Court of Chivalry, of which the constable and marshal were the constituent members. With the decadence of the Court of Chivalry martial law lost whatever character for regularity of administration it had possessed, and was dispensed by councils of war, commissions, and courts-martial, so called. Being defined by no written statute, its exercise was capricious and tyrannical, and it became an instrument of oppression in the hands of arbitrary sovereigns, who extended its operation to non-military as well as military persons, and to times of peace as well as of war. In the reign of Charles I. its abuse had become so great that the king was compelled by the Commons to give his assent to the bill which they had prepared, called the Petition of Right, one clause of which provided that the commissioners for proceeding by martial law should be dissolved and annulled, and that no such commission should be issued for the future. Under the Commonwealth martial law became somewhat more systemized than it had previously been, but it was not till the passage of the Mutiny Act, April 3, 1689, that there existed in England a regularly enacted statute for the government of the military state. (See MUTINY ACT.) From the passage of this act dates what is now properly understood as military law (which see). It is to be regretted that more care has not been taken by writers on law to distinguish between martial law and military law, as much of the opprobrium which is justly visited upon the former, on account of its capricious and arbitrary character, has come, by reason of such want of discrimination, to attach to the latter.

Sir Matthew Hale, in his history of the Common Law, observes of martial law, that "in truth and reality it is no law, but something indulged rather than allowed as law"; and the Duke of Wellington has defined it as "the will of the general who commands the army." A more expanded definition is given by an English authority as follows:

"Martial law is the suspension of all law but the will of the military commanders intrusted with its execution, to be exercised according to their judgment, the exigencies of the moment, and the usages of the service, with no fixed or settled rules or laws, no definite practice, and not bound even by the rules of the military law."

Martinet. A rigid disciplinarian, but one who, in matters of inferior moment, harasses all under him. An old word for *leech-line.*

Martingale. Ropes or chains from the ends

of jib- and flying jib-boom, to assist in counteracting the strain of the head-stays.

MARTINGALE BACK-ROPES. Ropes or chains from the dolphin-striker and setting up at the bows.

Martin's Shells. An incendiary shell lined with loam and hair and filled with molten iron.

Mascaret. A peculiar movement of the sea near Bordeaux in summer at low-water.

Masoolah Boat. See MASULAH BOAT.

Master. A line-officer of the grade next below that of lieutenant; he ranks with a first lieutenant in the army. He may be ordered to duty as navigator or watch officer, and messes in the ward-room. See NAVIGATOR, WATCH-OFFICER.

Master. The officer commanding a merchantman. His duties comprise the maintenance of discipline, the handling and navigation of the ship, the direction of the internal arrangements and economy of the ship, and the proper stowage of the cargo. To him great powers are confided and upon him great responsibilities rest. His legal rights, duties, and remedies in regard to owners, shippers, passengers, and crew are regulated by special statutes, by agreement with the owners, and by the customs of the sea.

In different ships different methods obtain of manning and provisioning the vessel. In some cases the master makes out an inventory of the stores required and they are accordingly supplied by the owner's order; in others the owners put the provisions on board with directions, more or less liberal, as to the manner in which the master is to dispense them. Usually the shipping of the crew is left to the shipping-masters, who are responsible for their appearance on board at the time of sailing; in other cases, the master, or perhaps the owner, selects his men himself.

Before sailing, the duties of the master (unless also supercargo) are mostly confined to looking after the outfit of the vessel and seeing that she is in sea-going trim. Everything being in readiness, the custom-house and other regulations complied with, the vessel is put under charge of the pilot to be taken clear of the land. While the pilot is on board the master has little else to do than to see the orders of the pilot carried out; when the pilot is discharged, the entire control and responsibility is thrown upon the master; he does not keep a watch, but is to be called whenever circumstances require it. The entire control of the navigation lies with him, though he may call upon his officers for assistance if necessary. He has a power and influence, both direct and indirect, which may be the means of much good or much evil.

Master, or Sailing-master. Formerly, the officer who did the duties now required of the navigator. See NAVIGATOR.

MASTER'S DIVISION. The division of the men stationed at the wheel, in the chains, tops, etc., and who are under the immediate direction of the navigator. The navigator's division.

Master-at-arms. The chief petty officer of a man-of-war. With his subordinates he attends to the police duties of the ship, prevents the smuggling of liquor, quells all disturbances, arrests all disorderly persons, keeps a vigilant watch over the conduct of the men, exercises supervision over all lights and fires, and has special charge of all men in confinement. In early days he instructed the crew in the use of small-arms.

Master-attendant (*Eng.*). An officer in the royal dock-yards appointed to assist in the fitting or dismantling, removing or securing vessels of war, etc., to inspect the moorings in the harbor, to visit all the ships in ordinary, and to attend at the general musters in the dock-yard, taking care that all the individuals registered in the navy-book are present at their duty.

Master Mariner. The shipmaster or captain of a merchant vessel.

Master of Misrule. An officer of an hour or two when the hands were piped "to mischief." The lord or abbot of misrule on shore has immemorially been a person selected to superintend the diversions of Christmas. In these "larks," however, malicious mischief was unknown.

Master's Mate. In early days an officer who assisted the master in his duties in the hold, on the decks, etc.,—generally a midshipman or passed midshipman. See MATE.

Masting. The determination of the position in which the masts of a vessel should be placed, and the mechanical process by which they are placed in position.

The first part of the definition is one of the problems of naval construction, full explanations of which can be found in works upon that subject.

The position in which the masts should be placed varies with the number with which a vessel is to be furnished, the rig, and, in some degree, upon the model. The object to be attained is to place the masts so that the centre of effort of the sails will be at a certain point depending upon the centre of lateral resistance of the vessel. The latter point varies with the trim of the vessel; but in a vessel that is perfectly balanced under sail with the wind on the beam, the centre of effort of sail is directly over the centre of lateral resistance.

By reason, however, of the pressure of the water in the lee bow when the vessel is in motion, the shape of the bow, the length of the middle body, heeling of the vessel, strength of wind, etc., the vessel has the tendency to fly into the wind,—called *ardency*,—which must be corrected by moving the centre of effort of the sails a sufficient distance forward of the centre of lateral resistance. The result, in a small degree, may be obtained by raking the masts forward or aft; but, as a general rule, the centre of the effort of the sails should be placed one-twentieth of the length of the water-line forward of the centre of lateral resistance.

In the masting of steam-vessels this rule cannot always be followed, on account of the necessary position of engines and boilers, and in steam-vessels where the sail-power is merely auxiliary, the placing of the masts by this rule is of less importance, as the sails are merely designed to steady the vessel in a rough sea without adding materially to the speed, or to keep her to the wind when hove to.

The mechanical operation of placing the lower-masts is the work of the seaman, and is performed by means of sheers or a derrick, under which the vessel is hauled, or by sheers rigged on the deck. In the former case either mast may be stepped first, the vessel's position being changed as required in order that the main purchase may plumb the mast-hole.

When a vessel is to be masted without the aid

of permanent sheers, they must be constructed on board the vessel. The deck must first be supported by shores placed under that part where the sheers are to stand.

Heavy spars, such as lower yards or topmasts, should be selected, and these may be strengthened by lashing lighter spars to them. The spars are placed in position one on each side of the deck, with their heels a little forward of the partners and a few feet from the vessel's side. The heads of the spars are crossed amidships, forming the sheer-head, and are lashed in such a manner that by spreading the legs of the sheers the lashing is tightened. The upper block of the main purchase is secured to the sheer-head by a lashing, which passes over the sheer-head lashing and allows the block to hang under the cross, while the upper block of the small purchase is lashed to the after fork of the sheers. Blocks are also lashed to the forks through which girtlines are rove, and guys are placed at the sheer-head and near the middle of the legs to support them, and retain them in position. Under the heels heavy shoes of plank should be placed, and the heels must be securely lashed to prevent them from slipping forward while the sheers are being raised. The sheers are raised by means of the main purchase and capstan, and if necessary a single spar may be used as a derrick to assist in starting the sheer-head.

If all of the lower-masts and the bowsprit are to be taken in, the mast nearest to the stern should be stepped first, as in transporting the sheers from the narrower to the wider part of the deck the sheer-legs will be spread and the sheer-head lashing tightened. Also, when the sheers are raked over the bow, as is required in getting in the bowsprit, they can be better supported if the foremast has been previously stepped.

The mast having been placed alongside with the head aft, the lower block of the main purchase is toggled to the garland, or large selvage strap, which is lashed to the mast at a sufficient distance from the heel to cause it to hang heel-heavy. The garland for the small purchase should be lashed as far above the larger as there is distance between the upper blocks of the two purchases. The mast is then raised by means of the capstan, eased inboard by guys as it comes above the rail, and lowered into its place, using the two purchases for sluing and pointing the mast as desired.

In stepping the other masts the same process is repeated, the sheers having first been transported to a new position.

For a more minute account of masting and sending aloft topmasts, topgallant-masts, etc., works on seamanship should be consulted.

Boat's masts are placed in accordance with the principles already stated, but great precision is not as necessary, as the balance of sail can be easily obtained within certain limits by trimming the boat with the weights on board, and thus changing the centre of lateral resistance as required. Care should, however, always be taken to retain the *ardency* of the boat, as with the wind abeam or close-hauled its pressure on the sails can be quickly lessened by a movement of the helm.

The number of the masts and the rig depends upon the service that is required, but in general those for ship's boats should combine strength with lightness, in order that they may carry the sail with safety and be easily handled by the crew; they should be sufficiently short to allow of being stowed snugly in the boat when not in use, and there should be a sufficient number to give to the boat the requisite amount of sail.—*E. T. Strong, Lieutenant U.S.N.*

Masts. The upright spars which are placed in a vessel to support the yards, gaffs, and booms upon which the sails are spread.

Masts are named from the position in which they are placed. In a vessel with two masts that nearest the bow is called the foremast, and the other the mainmast. When there are three masts they are named the fore-, main-, and mizzen-masts, and with four masts that nearest the stern is called the spanker-mast. In vessels of small size and simple rig each mast may be made from a single spar, but vessels of larger size and of a more complicated rig require the masts to be made in sections on account of the great difficulty in obtaining spars of sufficient length, the inconvenience in handling them, and the necessity of being able to send down the upper parts of the mast and leave the lower in position. These sections in a square-rigged mast are named the lower-mast, topmast, topgallant-mast, and royal mast. With masts fore-and-aft rigged there are but two sections, the upper one being called the topmast.

The lower-masts are stepped upon the keelson, and extend to a certain height above the upper deck, depending upon its position in the vessel, the rig of the vessel, and whether moved by steam or sails. Square-rigged sailing-vessels have comparatively shorter lower-masts than those of fore-and-aft rig, as the latter require them of greater length in order to accommodate the lower sails. The principal parts of the lower-mast are the heel, which rests upon the keelson; the partners, which are at the height of the deck where the mast is wedged; the hounds, or shoulders, where the head commences and upon which the trestle-trees rest; the head, which is that part above the hounds; and the bibbs, which are fitted pieces of timber bolted to the sides of the mast with their upper edges level with the hounds and giving additional support to the trestle-trees. The bibbs also strengthen the mast in that part which is most liable to strain and injury.

Lower-masts for small square-rigged vessels, and for all those of fore-and-aft rig, are made from a single spar, and are called single-tree masts. For large vessels the lower-masts are composed of several pieces united by dowels and hooped, and are called made-masts. These are stronger and more durable than single-tree masts and less liable to be defective.

The topmast is stepped forward of the lower-mast head, and its weight is sustained by the fid, which, passing through the fid-hole in the heel, rests upon the trestle-trees. The topmast also passes through the round hole of the cap which is placed on the lower-mast head, and that part of the two masts between the trestle-trees and the cap is called the doublings of the mast.

Platforms of semicircular shape, called tops, are placed over the lower-mast heads previous to stepping the topmasts and placing the caps, and rest upon the trestle-trees. The maintop is equal in breadth to half the breadth of beam,

while the fore- and mizzen-tops are proportionally smaller. Being secured on the underneath side to the mast below the bibbs, the topmast shrouds are set up to the rim on each side and give lateral support to the mast.

The topmast head is similar in construction to the lower-mast head. The hounds support the trestle-trees upon which the fid of the topgallant-mast rests, and the head of the topmast is surmounted by the cap through the round hole of which the topgallant-mast passes. Each mast is secured in position by shrouds, stays, and backstays independently of each other, so that the upper-mast can be sent down without disturbing the security of those below it.

To ascertain the dimensions of the several masts of a vessel, both as compared with the size of the vessel and with each other, works on shipbuilding should be consulted.

Timber for masting should be not only strong and durable, but also light and elastic. These qualities are found in the cone-bearing trees, as the pine, spruce, fir, etc.

The timber is principally obtained from the forests of Maine, Oregon, Canada, and the northern countries of Europe. Great care is required in its selection. The trees should be of sufficient age and well charged with resin, which gives strength to the wood and preserves it from insects and premature decay. After the timber is felled care is required in its preservation, and to this end the rough spars are buried in mud, or submerged or floated in wet-basins, where they are protected from changes of temperature.

Masts of iron have been constructed to some extent, but its use is confined principally to vessels of that material, as steamers, where extreme length of mast is not required. Iron lacks the elasticity and flexibility which is found in wood, and for that reason is not likely to come into general use. There are, however, some considerations in its favor, such as strength and durability, cheapness in localities where iron abounds, purposes of ventilation, and the facility with which masts of required dimensions may be constructed.

A jury-mast is a temporary mast constructed from such masts or spars as may be at hand to replace one that has been injured or lost by stress of weather or during an engagement.—*E. T. Strong*, *Lieutenant U.S.N.*

MAST-COAT. A canvas covering setting close over the wedges and partners of a mast to keep water out.

MAST-HEAD. The part of a mast above the hounds. *To mast-head*, to hoist up, or send up, to the mast-head; a well-known punishment for midshipmen.

MAST-HOLE. An aperture in a thwart of a boat or deck of a ship to receive a mast when it is stepped.

MAST-HOOPS. Iron hoops on a made-mast.

MAST-ROPE. A heavy rope used in swaying up or striking a mast.

Masulah, or Masoolah Boats. Madras boats, of which the planks are sewed together with coir-yarn, crossing the stitches over a wadding of coir or straw, which presses on the joints and prevents much leakage. The vessel is thus rendered pliable, and yields to the shock on taking the ground in the surf, which at times runs from 10 to 16 feet high. They are rowed by 12 men in double banks, with oars formed by an oval piece of board lashed to the end of a rough piece of wood. They are guided by one man with a long steering-oar, who stamps and yells with excitement as he urges the men to pull when a rolling surf is coming up astern. These boats are from 30 to 35 feet in length, 10 to 11 feet in breadth, and 7 to 8 feet in depth.

Mat. To prevent chafing a thick mat is woven from strands of old rope, spun yarn, or foxes, containing a number of rope-yarns in proportion to the size of the mat to be made. The largest and strongest kinds are called *paunch-mats.* The *thrum-mat* is similar to the cocoa-nut fibre door-mats. Where it is possible rounding is used instead of mats, it being neater and holding less water.

Matanzas, on the northwest coast of the island of Cuba, in lat. 23° 3′ N., lon. 81° 40′ W., is a fortified seaport town, and in commercial importance ranks next to Havana. The imports consist chiefly of articles of food, machinery, and materials for sugar and coffee plantations. Among the exports are sugar, coffee, molasses, tobacco, honey, wax, and fruits. The bay is spacious, easy of access, and completely sheltered from winds except those from the northeast, which bring in a heavy swell. Pop. 36,000.

Match. A *slow-match* is a loosely-twisted cord dipped in a solution of lime-water and saltpetre; it burns 4 to 6 inches per hour. A *quick-match* is cotton-wick saturated with a composition of mealed powder, gum, and spirits; it burns about three inches per second.

MATCH-STAFF. A pointed staff with a slit in the upper end; used to hold the slow-match.

MATCH-TUB. A conical tub about 18 inches in height, with a sunken head perforated with holes, in which the slow-match was hung.

Mate. A line-officer in the navy not in the line of promotion. He holds his position by appointment, messes in the steerage, and may be ordered to do duty in the boats, as mate of a deck, or such other duty as the commanding officer prescribes. The term is also applied to the assistant of the boatswain, gunner, armorer, etc.; and it also means an equal or partner; as, messmate, shipmate, etc.

Mate, Chief. The officer next in rank to the master of a merchantman. He is the active superintending officer carrying out the ideas and orders of the master. While in port the chief mate has more control of the vessel than when at sea, the master being generally engaged in transactions with the merchants and owners on shore. The chief mate has the charge of receiving, stowing, breaking out, and discharging of cargo, and is in command of the ship during the absence of the master. At sea the chief mate has command of the port watch; when all hands are called the master takes charge, and the mate is stationed on the forecastle. He is also intrusted with keeping the log. He is considered a confidential person to whom the owners, shippers, and insurers look for special duties and qualifications; the master, therefore, cannot remove him from office except under peculiar circumstances, and then must be able to prove a justifiable cause. The law makes the chief mate the successor to the master in case he should die or be unable to perform the duties of his office, and this without any action on the part of the

crew. It is, therefore, important that he should have a sufficient knowledge of navigation to take the ship to her destination.

Mate, Second. The second mate commands the starboard watch at sea, but when all hands are called on deck he leads the crew in their work, taking the weather earing in reefing and furling the bunts of the topsail and courses. He ought to have a good knowledge of marline-spike seamanship, as he is expected to attend to the most difficult of jobs in that line. In port the boat-duty falls to his lot, and in receiving and discharging cargo his station is in the hold.

Mate, Third. Merchant vessels bound on long voyages sometimes carry a third mate, but this is so unusual that his duties have not become settled by custom. He belongs to the port watch; he takes the bunt and the weather earing forward as the second mate does aft, and in port does a part of duty which would be otherwise allotted to the second mate.

Mates of Decks, Hold, and Hull. Junior officers who are responsible for the condition of decks, hold, or hull, and superintend all work done within their limits.

Mathemeg. A fish of the cod kind, inhabiting Hudson's Bay.

Maties. Dock-yard artificers, shipwrights, carpenters, etc.

Mato. A shell formerly of some commercial value on the west coast of Africa.

Matthew Walker. A knot, so termed from the originator. It is formed by a half-hitch on each strand in the direction of the lay, so that the rope can be continued after the knot is formed, which shows as a transverse collar of three strands. It is the knot used on the end of the laniards of rigging where dead-eyes are employed.

Maud. A salmon net fixed in a square form by four stakes.

Maund. An Indian weight, which varies in amount, depending on the part of the country. Also, a basket used by fishermen; a measure of small fish.

Maunjee. The native boatmen of the river Hooghly.

Maury, Matthew Fontaine, LL.D., naval officer and hydrographer. Born in Spottsylvania County, Va., January 14, 1806. While he was young his parents removed to Tennessee. Midshipman, February 1, 1825, and while circumnavigating the globe in the "Vincennes" began his treatise on "Navigation." Lieutenant, June 10, 1836. In 1839 he met with an accident which resulted in permanent lameness and unfitted him for active service afloat. While confined from this cause he amused himself by writing a series of articles on various abuses in the navy, published in the *Southern Literary Messenger*, entitled "Scraps from the Lucky Bag, by Harry Bluff." He was then placed in charge of the Hydrographical Office, and on its union with the Naval Observatory, in 1844, he became superintendent. He investigated the physical geography of the sea, and gathered many observations of the ocean winds and currents from the records of naval and merchant vessels. In 1844, Lieut. Maury's paper respecting the Gulf Stream, ocean currents, and great circle sailing was read before the National Institute, and printed in the *Southern Literary Messenger*. The principal results of his researches are embodied in the wind and current charts and the sailing directions published by the Observatory for general distribution among mariners, and in the "Physical Geography of the Sea" (New York, 1855). In 1855 he was made commander, and in 1861 threw up his appointments and joined in the Rebellion. Resigned the presidency of the University of Alabama in 1871. Member of the principal scientific associations of America and Europe, from whom, as well as from foreign governments, he has received distinguished honors. He has beside the above published "Letters on the Amazon, and the Atlantic Slopes of South America," "Relation between Navigation and the Circulation of the Atmosphere," "Astronomical Observations," 1853, and also several addresses before literary and scientific bodies.

Mavis Skate. The sharp-nosed ray.

Maw, or **Sea-maw.** The common gull, *Larus canus*.

Mayaguez is the third town of importance of the island of Porto Rico. It has a very good harbor, and the exports and imports have each exceeded $3,000,000 in a year. Sugar, molasses, coffee, hides, fruit, and turtle-shell are leading exports. Pop. 12,000.

Maze. In the herring trade, 500 fishes.

Mazolet. An Indian bark-boat, calked with moss.

McCawley, Charles G., Colonel U.S.M.C. Born in Pennsylvania. Appointed from Louisiana.

Commissioned as second lieutenant, March 3, 1847; in June, ordered to join battalion of marines for service with army in Mexico; participated in the storming of the castle of Chapultepec and taking of the city of Mexico; brevetted first lieutenant for gallant and meritorious conduct in these actions, September 13, 1847; in August, 1848, was ordered for duty at marine barracks, Philadelphia; December, 1848, marine barracks, Boston; July, 1849, "Cumberland," Mediterranean Squadron; March, 1850, at Naples, to razee "Independence"; August, 1852, marine barracks, Philadelphia; June, 1853, "Princeton," Home Squadron.

Promoted first lieutenant, January 2, 1855; July, 1855, marine barracks, New York; December, 1855, marine barracks, Boston; July, 1857, "Mississippi"; detached, and ordered to Philadelphia; December, 1857, "Jamestown," at Philadelphia, for Home Squadron; March, 1860, marine barracks, Philadelphia; December, 1860, "Macedonian," Home Squadron, Atlantic coast, West Indies, and Spanish Main; January, 1862, marine barracks, Boston; detached immediately, and ordered to join battalion of marines at Bay Point, S. C.; April, 1862, returned with battalion to Washington.

Received commission as captain, July 26, 1861; ordered in command at headquarters; May, 1862, ordered with detachment of 200 men to reoccupy the Norfolk Navy-Yard; hoisted the flag again on the part of the navy; October, 1862, ordered to headquarters, Washington, D. C.; in command until July, 1863; ordered to join battalion of marines, for service in South Atlantic Squadron; served with same on Morris Island during bombardment and destruction of Fort Sumter, and capture of Forts Wagner and Gregg; commanded a detachment of 100 men and officers in

the boat attack on Fort Sumter, September 8, 1863; received a brevet as major for gallant and meritorious conduct in this action; served on Folly Island; and in December, 1863, battalion returned to Philadelphia; marine barracks, Philadelphia.

Promoted major, June 10, 1864; ordered to marine rendezvous, Philadelphia; March, 1865, ordered to command marine barracks, Boston.

Promoted to lieutenant-colonel, December 5, 1867; August, 1871, ordered to command marine barracks, Washington, D. C.; June, 1872, appointed superintendent of recruiting, in addition to other duty ordered to New York to attend to organizing the recruiting service; returned to Washington, November, 1872.

Promoted colonel commandant of the U. S. marine corps, November 1, 1876.

McClintock, Sir Francis Leopold. Born at Dundalk, Ireland, in 1819. Entered the British navy in 1831, at 12 years of age; accompanied Sir John Ross's Arctic Expedition in 1848, and Capt. Austin's expedition in 1850 in search of Sir John Franklin as a lieutenant. Promoted to commander in 1851, and accompanied the expedition of Sir Edward Belcher, which rescued Capt. McClure, who had been imprisoned for three years by the ice near Melville Island; in 1857 he was sent by Lady Franklin in command of the "Fox" in search of Sir John Franklin, and had the satisfaction of proving that Sir John had made a discovery of the northwest passage communicating with the Pacific, and also ascertained the positive fate of Sir John and his expedition; for this he was knighted in 1860. In October, 1871, he was promoted to rear-admiral, and in 1872 was made superintendent of the Portsmouth dock-yard. Promoted to vice-admiral, August 5, 1877.

McDonough, Thomas, Commodore U.S.N., was born in New Castle, Del., December, 1783. He was appointed a midshipman in 1800. He sailed in the "Philadelphia," Capt. Bainbridge, arriving off Tripoli August 24, 1803. When that ship was captured, he was absent in a prize, and did not suffer captivity. He was then sent to the "Enterprise" with Decatur, and was engaged in the destruction of the "Philadelphia" in the ketch "Intrepid." He was engaged in the attacks of August 3 and September 28, particularly distinguishing himself in the former. In 1806 he was a lieutenant in the "Siren" under Stewart, and was very intrepid in protecting American seamen from imprisonment.

In January, 1806, he was promoted to lieutenant. He was sent to command the forces on Lake Champlain in the summer of 1812. In 1813 two ships of his small squadron were captured, but it was increased the following year, and on the 11th of September, while at anchor near Plattsburg, he was attacked by an English squadron of 4 ships and 13 galleys, but by consummate ability and seamanship, particularly in anchoring his ships, he defeated the enemy with his squadron of 4 ships and 11 galleys, after a long and bloody battle. He was wounded slightly. Received a medal, 100 acres of land from the State of Vermont, and was promoted to captain, September 11, he having been already promoted to master commandant, July 20, 1813. From 1816 to 1818, he was attached to the navy-yard, Portsmouth, N. H. From 1819 to 1821, he was in command of the frigate "Guerriere" in the Mediterranean. He was then in command of the "Ohio," 74, in ordinary at New York Navy-Yard, and in 1825 he went again to the Mediterranean, flying his flag on the frigate "Constitution." He died of consumption, while on his way home in her, November 10, 1825, aged 42.—*F. S. Bassett, Lieutenant U.S.N.*

McDougal, David D., Rear-Admiral U.S.N. Born in Ohio. Appointed from Ohio, April 1, 1828; sloop "Natchez," West India Squadron, 1829–31; frigate "Brandywine," Mediterranean Squadron, 1832–35.

Promoted to passed midshipman, June 14, 1834; navy-yard, New York, 1835–36; sloop "Natchez," West India Squadron, 1837–39; brig "Consort," coast survey, 1840–43.

Commissioned as lieutenant, February 25, 1841; navy-yard, New York, 1843–44; steamer "Michigan," on the lakes, 1845–46; sloop "St. Mary's," 1846; attached to steamer "Mississippi," at the capture of Vera Cruz; brig "Bainbridge," 1848–50, coast of Africa; steamer "Michigan," on the lakes, 1852–54; commanding store-ship "Warren," 1855–57.

Commissioned as commander, January 24, 1857; navy-yard, Mare Island, Cal., 1859–60; commanding steam-sloop "Wyoming," Asiatic Squadron, 1861–64; while in command of the "Wyoming," engaged 6 batteries and 3 vessels of war, at Simonsaki, Japan, July 16, 1863, sinking a brig and exploding the boilers of a steamer, with a loss of 11 killed and wounded on the "Wyoming."

Commissioned as captain, March 2, 1864; commanding navy-yard, Mare Island, Cal., 1865–66; commanding steam-sloop "Powhatan," South Pacific Squadron, 1868–69.

Commissioned as commodore, 1869; commanding South Squadron, Pacific Fleet, 1870–72; retired, December 27, 1871.

Commissioned as rear-admiral, September 27, 1873.

McKean, William, Commodore U.S.N. Born in Pennsylvania, in 1801; died near Binghamton, N. Y., April 22, 1865. Son of Judge McKean. Midshipman, November 30, 1814; lieutenant, January 13, 1825. Commander, September 8, 1841; captain, September 14, 1855; commodore, July 16, 1862; governor of Naval Asylum, 1858–61; retired, July 16, 1862. Commanded a schooner in Porter's West India Squadron, 1823–24, and active in suppressing piracy there. In 1860 on special service of conveying the Japanese Embassy home, and on his return was for a short time in command of the West Gulf Blockading Squadron.

McKeever, Isaac, Commodore U.S.N. Born in Pennsylvania, April, 1793; died in Norfolk, Va., April 1, 1856. Midshipman, December 1, 1809; lieutenant, December 9, 1814, and commanded a gunboat in the flotilla of Lieut. Jones, which was captured by the British on Lake Borgne, La., December, 1814. In the engagement, which was very warm, he was severely wounded. In the galliot "Sea-Gull," in 1825, aided by some boats of the British frigate "Dartmouth," he, after a sharp fight, captured two pirate schooners. May 27, 1830, he was made a commander, and a captain in December, 1838. He commanded the squadron on the coast of Brazil in 1851–54.

Mealed Powder. See POWDER.

Mean. A term implying medium; average.

MEAN NOON. See NOON.

MEAN SUN. A fictitious sun which is conceived to move uniformly in the equinoctial with the mean velocity that the true sun has in the ecliptic.

MEAN TIME. See TIME.

Meck. A notched staff in a whale-boat on which the harpoon rests.

Medical Corps of U. S. Navy. The active list of the medical corps of the navy consists of 15 medical directors, ranking with captains; 15 medical inspectors, ranking with commanders; 50 surgeons, ranking with lieutenant-commanders or lieutenants; and 100 passed assistant and assistant surgeons, ranking with lieutenants, masters, or ensigns, according to length of service.

Assistant surgeons enter the service after examination by a board of medical officers, and at the completion of two years' sea-service are subject to another thorough examination, which is competitive, and which determines their permanent place upon the register.

The surgeon-general is selected by the Secretary of the Navy, and appointed by the President from among the senior medical officers, and is commissioned for four years, by and with the advice and consent of the Senate. The surgeon-general is chief of the Bureau of Medicine and Surgery in the Navy Department, and has charge of all matters pertaining to the medical outfit of vessels, to naval hospitals, and to the naval laboratory; the detailing of medical officers for service; and all papers and records pertaining to the medical department, as well as the expenditure of all moneys for the purchase of supplies and for the maintenance of hospitals. See MEDICAL OFFICERS, DUTIES OF.—*E. Shippen.*

Medical Officers of U. S. Navy, Duties of. *Surgeons of the fleet*, who are usually medical inspectors or senior surgeons, are to exercise supervision over all medical officers serving under them, and from time to time to inspect their journals, abstracts, instruments, dispensaries, and store-rooms. The fleet-surgeon is also to assure himself of the correctness of all medical reports and returns, and indorse as approved all certificates of death or disability, and reports of survey, before forwarding them to the Bureau of Medicine and Surgery.

He also examines and approves all requisitions for medical and hospital stores for the fleet or squadron, and inspects their quality. On foreign stations he purchases these supplies, or selects them from the naval store-house, making requisitions therefor, as far as possible, at regular periods.

He makes and transmits to the Bureau of Medicine and Surgery records of the character and treatment of diseases occurring in the fleet or squadron. He is also to suggest measures for the preservation of health in the fleet.

On the probability of an engagement he is to assure himself that the medical department of every ship is prepared for the treatment of wounded; and after battle will make to the commander-in-chief, and to the bureau, a summary report of casualties. He is also to forward to the bureau an aggregate report for each quarter, comprising all diseases in the squadron, with a summary of bills incurred, and an epitome of the remarks of medical officers in cases likely to give rise to claims for pension.

General Duties of Naval Medical Officers.—The senior medical officer of every naval station and of every vessel in commission shall keep, or cause to be kept by a medical officer subordinate to him, the following official records, viz.:

A *list of patients*, with complete description of person, details of and final disposition of each case. This is to be embodied in a quarterly report.

A *medical journal*, with complete description of person, and history of cases, properly indexed.

A *yearly abstract of patients*,—a concise, alphabetical record of every case of injury or disease occurring in the navy, with full personal description, and whether occurring in the line of duty or not.

A daily *report of sick*,—made every morning to the commanding officer, in a sealed envelope.

A daily *binnacle list*, of all persons excused from duty.

Whenever a patient is transferred from the charge of one medical officer to that of another, he must be accompanied by his effects, with a list thereof upon a *hospital ticket*, which ticket gives a description of the person, and all facts in the case, as well as the origin of the disability,—whether in line of duty or not.

A *report of sick* is made *quarterly* to the surgeon of the fleet, or to the Bureau of Medicine and Surgery, and with it are forwarded triplicate receipts for articles obtained from public stores during the quarter, and a triplicate of all bills paid; a daily record of atmospheric observations, and, on April 1 and October 1, requisitions for supplies for the next six months. Medical officers of cruising vessels are required to note on this quarterly report of sick the ports visited, and the number of days at sea and in port during the quarter.

Certificates of disability, and *certificates of death*, and all other papers interesting to parties claiming pensions, are to be forwarded without delay, through the proper channel, to the surgeon of the fleet or to the bureau direct.

The senior medical officer is to prepare his own receipts and returns; and if relieved, is to leave to his successor all necessary official papers, taking a receipt for them in duplicate.

At shore-stations, hospitals, and receiving-ships the senior medical officer is required to make, on July 1 of each year, an *inventory* of all property in his charge, which inventory is to be transmitted to the Bureau of Medicine and Surgery.

The senior medical officer of every vessel and station is required, on each 1st of January, to make a *sanitary report* to the bureau, embracing *hygiene*, *climatology*, and *medical topography* of all places visited, with all attainable information respecting statistics of disease and its causes, medical schools, hospitals, charitable institutions, etc.

By law, all spirits on board ship are to be under the charge of the senior medical officer, and issued only on his prescription.

Assistant surgeons, candidates for promotion, must present to the Board of Examiners testimonials of proper habits from the medical officers with whom they have been associated on

duty, and a medical journal in the candidate's own handwriting. Also observations upon the hygiene of vessels and stations to which they may have been attached, and upon medical topography, hospitals, and other matters of professional interest.

Passed assistant and assistant surgeons, when in separate charge, will be governed by the same instructions as surgeons.

Director of the laboratory will receive timely notice of the probable force to be kept afloat, and for this and other current wants will keep in hand, by manufacture or otherwise, an adequate stock of the articles enumerated in the supply table. Accurate invoices, inventories, and receipts are required in receiving supplies from the laboratory, or in returning them, after a vessel has been put out of commission; at which time a final return of property is also to be made to the bureau. When medical stores are publicly sold, an invoice and account of sale are to be sent to the bureau, and the money resulting from such sale to be deposited, without delay, with the nearest government depositary, proper receipts being taken.

Recruiting.—An important duty of medical officers is connected with recruiting, and they are held strictly accountable to the bureau for improper enlistments.

Medical officers are required to make *certificates of physical examinations* of enlisted men, and to keep a *record of physical condition* of all minors, including cadets and apprentices,—examinations of whom are to be made at intervals of twelve months. The record of the cadets is to be retained at the Naval Academy. In case of apprentices and enlisted minors it will constitute their descriptive list, and accompany them throughout their career in the service.

An accurate list of persons examined for enlistment or appointment is to be kept wherever such enlistments are made, in every case to be signed by the medical officer making the examination.

A *descriptive list* of all men transferred or discharged is to be signed by the executive-officer and the senior medical officer.

When defects are waived by the Navy Department, in cases of enlisted men, the medical officer is fully to describe the same, and report the case to the Bureau of Medicine and Surgery, as a bar to claims for pension.

Medical officers are to vaccinate all recruits, and to make regular reports of the results.

In *sea-going ships*, as soon as possible after reporting for duty, the senior medical officer is to inspect the dispensary and store-rooms, examine the outfit, prepare medicines and instruments for use, and report his department ready for inspection. Having secured everything for sea, he opens his medical journal upon the day when the officers and crew are received on board. He examines the crew, by divisions, and reports those whom he considers disqualified for service, and calls for a medical survey if necessary. He causes all who may require it to be vaccinated, and instructs such persons as the commanding officer shall designate in the use of the tourniquet. He will always be prepared for battle, and, after an engagement, will report casualties to the commanding officer and to the surgeon of the fleet, with complete details of each case.

On board ship, all wines, spirituous liquors, mineral acids, and inflammable fluids in the medical department must be locked up by themselves, to be disposed of, in case of fire, as the exigency demands.

Naval Hospitals.—The medical officer in charge of a naval hospital is to enforce strict obedience to the laws and regulations of the Navy Department, in accordance with the established usages and discipline of the service. The hospital, its grounds and appurtenances, and all persons and property attached to it, are to be under his control. He is responsible for the proper treatment of the sick and wounded, and for the good order, cleanliness, discipline, and economy of the entire establishment, and is to preserve everything in good condition. No punishment is to be inflicted without his orders. The medical officer second in rank is to reside in the hospital, and to have general charge in medical duty, but is to consult the officer in charge in all important matters. He is to assign duty to the junior medical officers, and to report to the officer in charge any neglect of duty or breach of discipline.

He is to see that the hospital records are carefully and neatly kept, and signed by the proper officers with name and rank. He, or an assistant, by his order, is to make a careful inspection, daily, of the wards, dining-rooms, kitchens, laundry, and cellars, and report their condition to the medical officer in charge. He is also to inspect all provisions, medicines, groceries, and bed and table furniture that may be received, and report any deficiency to the officer in charge.

Junior medical officers serving in hospitals, in addition to their duties in the wards, shall be detailed, in turn, as officer of the day, and are not to leave the building during their tour of duty. The officer of the day is to inspect the food at meal-times, and to attend to the admission and discharge of patients, and to see that proper papers are sent and received.

The medical officer in charge of a hospital ward is responsible for order, neatness, and good conduct therein, as well as for everything regarding the welfare of the sick and wounded.

The medical officer in charge of a hospital is to make no changes in the hospital buildings or grounds without permission of the Bureau of Medicine and Surgery. He is carefully to scrutinize the monthly pay-roll of persons employed under the bureau before signing it.

The products of the ground attached to a naval hospital are to be expended for the benefit of the hospital, at the discretion of the surgeon in charge.

The official papers pertaining to the conduct of naval hospitals are principally as follows, viz.: hospital tickets, alphabetical register, quarterly list, abstract of patients, journal of subsistence, case papers, ration notices, certificate book, certificates of ordinary disability and certificates of death, reports of surveys, declarations for pension, vouchers for expenditure, hospital ration return, receipt and expenditure book, requisitions, weekly report of sick, weekly report of beds, and monthly pay-roll.

Surveys, upon persons and upon medical property.—Personal surveys, next to the preservation of life and limb, are the most important duties of medical officers. The Commissioner of Pensions founds his decisions upon them. In

case of surveys, and all matters connected with the evidence in pension claims, medical officers are forbidden to give information to agents or others. All such persons must be referred to the Commissioner of Pensions.—*E. Shippen.*

Medicine-chest. A chest containing a supply of medicines for the use of the crew of a merchantman. Every vessel of 150 tons or more, navigated by 10 or more persons in all, and bound on a voyage beyond the United States, and every vessel of 75 tons or more, navigated by 6 or more persons in all, is required to have a chest of medicines, put up by an apothecary of known reputation, and accompanied by directions for administering the medicines. The chest must be examined at least once a year, and supplied with fresh medicines. In case of dispute the owner must prove the sufficiency of the medicine-chest; it does not lie with the seaman to prove its insufficiency. If a seaman requires further medicines and medical advice than the chest and directions can give, it would seem that the ship ought to bear the expense. If the medicine-chest can furnish all the needs, the ship is exempted.

Medico. A familiar appellation for the ship's surgeon.

Mediterranean Pass (*Eng.*). A document formerly granted by the lords of the Admiralty to registered vessels, which was valuable when the Barbary powers were unchecked.

Meermaid. A name given by the English fishermen to the *Lophius piscatorius*, or frog-fish, without reference to the mermaid.

Meer-swine. The porpoise (from the German *meerschwein*).

Meet Her! The order to adjust the helm so as to check any further lateral movement of the ship's head.

Melanurus. A small fish of the Mediterranean; a species of *Sparus*, or gilt-head.

Melbourne is situated on the Yarra Yarra, 8 miles from its mouth, in Southeastern Australia, colony of Victoria, of which it is the capital. Lat. 37° 43′ 53″ S.; lon. 144° 47′ 42″ E. The river has a bar at its mouth, and a second half-way to the town, which compels the largest shipping to anchor at Hobson's Bay, near the mouth of the harbor, to which there is now a railway direct from Melbourne, with two piers projecting into deep water. The commerce of Melbourne is very extensive, and represents about nine-tenths of the entire trade of the colony. Melbourne is the first and last port of call for the mail-ships to Galle. Pop. 62,000; including adjacent boroughs, 247,000.

Memel. A seaport town of Prussia, at the north end of the Curische-Haff, where the Dange falls into the Baltic. Lat. 55° 43′ 42″ N.; lon. 21° 6′ 12″ E. It is the seat of an admiralty court, and contains an exchange, marine hospital, school of navigation, and other fine buildings. It is the entrepôt of the foreign trade of Western Russia. It has extensive manufactures, but the great source of its prosperity is its trade, which consists chiefly of timber, corn, flax, hemp, etc. The harbor is large and safe, and has a depth of water of from 14 to 17 feet. Ship-building is carried on to a considerable extent. Pop. 20,000.

Memphis, Shelby County, Tenn., is the principal city in the State, and is the most important and populous town on the Mississippi River between St. Louis and New Orleans. It is beautifully situated on a bluff, elevated about 60 feet above high-water mark, the base of which is washed by the river for a distance of three miles, while a bed of sandstone projects into the stream and forms a convenient landing. It occupies the only eligible site for a commercial depot from the mouth of the Ohio to Vicksburg. As a market for cotton it is surpassed by only two or three cities in the United States; the quantity received in a year is about 400,000 bales, valued at $33,000,000. Pop. 62,500.

Mend. *To mend sail*, or *mend the furl*, to skin the sails up afresh when they have been badly furled.

Menendez de Aviles, Pedros, a distinguished Spanish officer of an ancient Asturian family. Born in 1519; died about September 15, 1574. Wild in his youth, he gained distinction in cruises against the corsairs and the French; acquired wealth in the New World; was captain-general of the fleet sent with troops to Flanders, contributing, it is said, to the victory of St. Quentin. Afterwards went to the West Indies as general of the fleet and army; amassed vast riches, and, in 1561, on his return to Spain, was arrested by the Council of the Indies, imprisoned, and heavily fined for his conduct there. At the head of an expedition for the conquest and colonization of Florida, he sailed from Cadiz, June 29, 1565. September 7 he discovered the bay and river, which he named St. Augustine, and landing, took formal possession on the 8th, and laid the foundation of St. Augustine, the oldest town in the United States. September 21, at daybreak, he surprised and put to the sword the French Huguenot garrison at Fort Caroline,—a piece of cruelty afterwards avenged by De Gourgues upon the Spanish garrison there. He returned to Florida two years later, rebuilt San Mateo, and in 1574, after his return to Spain, was given the command of the Armada of 300 sail at Santander, destined against England, when he died suddenly, at the age of 55.

Menkalinan. The star β *Aurigæ.*

Menkar. The bright star α *Ceti.*

Menopome. One of the largest batrachians found in some of our rivers, and known by many names, such as *hell-bender*, *tweeg*, *mud-devil*, *ground-puppy*, etc.

Mensa. See CONSTELLATION.

Merak. The star β *Ursæ Majoris.*

Mercantile Marine. A collective designation of the persons and vessels engaged in transporting the commodities exchanged in commerce.

Mercator's Chart. A chart constructed on what is called Mercator's projection. All the meridians are parallel right lines, and the degrees of longitude are all equal; the parallels of latitude are at right angles to the meridians, and the degrees of latitude increase in length from the equator to the pole in the same proportion as the degrees of longitude decrease on the globe. It may be constructed with the aid of a table of meridional parts. The property which makes the Mercator's chart so useful for purposes of navigation is, that on it the track of a ship appears as a straight line. See CHART.

Merchantman. A vessel employed in conveying freight or passengers, as distinguished from a national vessel, and from vessels in the revenue service, coast survey, etc.

Merchant Service. The mercantile marine.

Mercurial Gauge. A pressure-gauge which depends for its action upon the effect of the fluid on a column of mercury; the pressure may act directly on the column or be transmitted by an intervening fluid, one or more pistons, or an elastic diaphragm of metal or other suitable material.

Mercury. The nearest planet to the sun. Mean distance, 37 millions of miles; diameter, 3000 miles; apparent diameter, 5″ to 12″. Symbol ☿, representing a wand. See VULCAN.

Merganser. A genus of birds of the family *Anatidæ.* They inhabit the coasts of northern regions, but migrate southwards in winter.

Meridian. A great circle passing through the poles of a sphere. A *terrestrial* meridian is an ellipse formed by the intersection of the earth's surface by a great circle passing through the poles. A *celestial* meridian is a great circle of the celestial sphere passing through the poles; it intersects the horizon in its north and south points. *Prime meridian,* the origin whence longitude is reckoned. A *meridian-line* is the line formed by the intersection of the meridian and the plane of the sensible horizon; a north-and-south line. *Meridian altitude,* the altitude of a heavenly body when it bears due north or due south. *Meridian zenith distance,* the complement of the meridian altitude. *Meridional difference of latitude,* the quantity bearing the same proportion to the difference of latitude that the difference of longitude bears to the departure. *Meridional parts.* At the equator a degree of longitude is equal to a degree of latitude, but, as we approach the poles, while (supposing the earth to be a perfect sphere) the degrees of latitude remain the same, the degrees of longitude become less and less. In the chart on Mercator's projection the degrees of longitude are made everywhere of the same length, and therefore, to preserve the proportion that exists at different parts of the earth's surface between the degrees of latitude and the degrees of longitude, the former must be increased from their natural lengths more and more as we recede from the equator. The lengths of small portions of the meridian thus increased, expressed in minutes of the equator, are called *meridional parts.* *Meridional projection,* a projection of a sphere in which the plane of projection coincides with or is parallel to the meridian.

Merkin. An old name for a sponge for cleaning cannon.

Merling. A small fish; *Merlangus vulgaris* (*Gadus merlangus* of Linnæus); the whiting.

Mermaid (German *meer,* sea, and *magd,* maid). A fabulous creature, the fore part woman, the hinder part fish. The species of actually existing animals that, viewed at a distance in the sea, may have originated the idea of mermen and mermaids are the cetaceous *dugong* and *manatee.* These have their fore fins rudely fashioned like arms and hands, and terminate behind in a fish-like tail. The nipples are pectoral, and they are often seen ascending to the surface to breathe, clasping their sucking young to the breast. The mermaid is a not unfrequent heraldic bearing. In the heraldry of France she is called a siren, and in Germany she is occasionally fitted with two fishy tails.

MERMAID'S GLOVE. The name of a peculiar sponge (*Spongia palmata*) abundant at Bermuda. It derives its name from a somewhat finger-like arrangement of its branches.

MERMAID'S PURSE. The oblong, horny cases with long filiform appendages developed from each of the four corners, found on the sea-shore, being the outer coverings of the eggs of several species of rays and sharks. Also, the hollow root of the seaweed *Fucus polyschides.*

Merman. See MERMAID.

Merry Dancers. The glancings and coruscations of the aurora borealis or northern lights.

Merry Men of May. Dangerous currents formed by the ebb-tides.

Mesh. The opening between the lines in a net.

Mess. A company of officers or men of a ship who take their meals together. The commanding officer messes alone; if there be more than one cabin-officer on board, they may form one mess if they desire. The wardroom mess is composed of the staff-officers above the grade of ensign, and of line-officers from lieutenant-commander to master, inclusive. If an ensign has charge of a watch and a division he messes in the wardroom. If a staff-officer having the relative rank of ensign is the head of a department he messes in the wardroom. The steerage mess is composed of ensigns, midshipmen, and clerks. The warrant-officers' mess is composed of the boatswain, gunner, carpenter, and sailmaker. Passengers mess with the officers of corresponding rank. The caterer of a mess has charge of its general conduct and order, but the executive-officer has the power to interfere to prevent disorder.

The master-at-arms, orderly sergeant, all yeomen, apothecary, machinists, coppersmiths, and boiler-makers mess together on the berth-deck. Petty officers may be messed by themselves. The crew is divided into messes of convenient size, and a certain part of the deck assigned them; they are allowed to commute as many rations as may be authorized by the commanding officer, and the money is expended for fresh provisions or may be divided up among them.

MESS-CLOTH. A tarpaulin spread on the deck, answering the purpose of a table-cloth.

MESS-GEAR. Pots, pans, spoons, knives, forks, etc.

MESSMATES. Members of the same mess.

MESS-TRAPS. Mess-gear (which see).

Messenger. An endless rope or chain going around the capstan and a roller at the manger. The messenger is securely bound to the cable by nippers, and as the capstan is hove around the cable is hauled in. As the nippers approach the capstan they are taken off and others put on near the hawse-hole. Messengers are out of date, and are not to be met with on board men-of-war, except in a few old sailing-vessels. The cable is now brought direct to the capstan. See CAPSTAN, NIPPERS. Also, a boy to carry messages from the quarter-deck.

Messina, Sicily, is situated on the Strait of Messina, in lat. 38° 11′ 10″ N., lon. 15° 34′ 45″ E.; is strongly fortified, being walled and defended by a citadel and forts. The harbor, one of the best in the Mediterranean, is of great depth and perfectly secure in all weather. Its manufactures of silk goods and satins have long been famous, and its commerce is very extensive.

The exports consist chiefly of silks, fruits, wine, spirits, sumac, etc. It has valuable tunny and other fisheries. Population, including suburbs, 112,000.

Meta-centre. The meta-centre of a floating body is the point where the vertical passing through the centre of buoyancy in the position of equilibrium meets the vertical drawn through the new centre of buoyancy, when the body has been slightly displaced from this position. It is a point in a ship above which the centre of gravity of weight must never be placed, because if it were the vessel would at once capsize.

Metal. The ordnance of a ship. *Heavy metal*, guns of great calibre.

Metallic Packing. Piston-packing of one or more metallic rings, usually iron or brass; also, a patent piston-packing composed of braided wire.

Metalline. A soft metallic compound for lining journal-boxes.

Meteor. See AEROLITES.

Meteorology. The science which treats of the air and its phenomena.

Metonic Cycle. A cycle of 19 years, which contains 235 lunations, and results in a correspondence of the solar and lunar years. The discovery of this astronomical period may be assigned to Meton in 432 B.C. See CYCLE.

Mètre (*Fr.*, from Gr. *metron*, a measure). The French standard measure of length, being the ten-millionth part of the quadrant of the meridian. The other measures of length are referred to this, the whole system being decimal; Latin prefixes are used to indicate division, Greek prefixes, multiplication. Thus, a *decimètre* (*decem*, ten) is the tenth of a mètre; a *centimètre* (*centum*, a hundred), the hundredth part of a mètre; a *millimètre* (*mille*, a thousand), the thousandth part of a mètre. Again, a *decamètre* (*δέκα*, *deka*, ten) is ten mètres; a *hectomètre* (*ἑκατόν*, *kekaton*, a hundred) is one hundred metres; a *kilomètre* (*χίλιοι*, *chilioi*, a thousand), one thousand mètres; a *myriamètre* (*μυριάς*, *murias*, ten thousand), ten thousand mètres. A mètre is equal to 39.37079 English inches; and from this all the other French measures may be obtained by shifting the decimal point.

Micrometer (Gr. *mikros*, little, and *metron*, a measure). An instrument used with the telescope or microscope for measuring minute distances, or the diameters of objects which subtend very small angles. Contrivances of various kinds, and depending on different principles, have been employed for this purpose. The micrometer is of the utmost importance in astronomy, and to it that science is as much indebted as to the telescope itself. Its most simple form, as applied to astronomical purposes, is that of a short tube, across the opening of which are stretched two parallel threads, which can be made to approach or recede from each other by means of screws. These two threads are crossed by a third perpendicularly, and the whole apparatus is placed in the focus of a lens. The distance of two stars is found by adjusting the two parallel threads, one to pass through the centre of each star, taking care that the threads are placed perpendicular to the line joining the stars, and finding how many turns and parts of a turn of the screw are required to bring the wires to coincide. The angle of position of two stars is also obtained by turning round the instrument till the third wire, which is normally horizontal, bisects both stars, and reading off on the circumference the arc passed over. Another form of micrometer is the circular, the principle of which may be described as follows: if the field of a telescope be perfectly circular, and if its diameter be determined from observation, the paths of two celestial bodies across the field may be considered as two parallel chords, which are given in terms of a circle of known diameter. The differences of the times at which two stars arrive at the middle of their paths will be their ascensional difference; and the distance between the chords, which is readily computed from their lengths, gives the difference of the declinations of the two bodies. The most approved construction of the annular micrometer is that of Fraunhofer, which consists of a steel ring surrounded by a flat rim of glass and mounted in a brass tube, so that it may be accurately adjusted in the focus of the eye-piece of the telescope. When so applied the steel ring is alone visible and appears as if suspended in the atmosphere, whence the instrument is called the *suspended annular micrometer*. The advantage of this construction consists in the accuracy with which the moment of ingress or egress is determined from the body being seen in the field of view before it comes up to the edge of the steel ring. The annular micrometer is conveniently used for comparing the place of a small star or a comet with that of a known star in nearly the same parallel of declination. The Abbé Rochon, in the beginning of the present century, conceived the ingenious idea of applying the principle of double refraction to micrometrical measurement. He constructed an instrument composed of two prisms of rock-crystal or Iceland spar. These prisms were fixed together with their axes of crystallization at right angles to each other, to increase the deviation of the two images; and the micrometer thus constructed was placed *within* the focus of the object-glass of a telescope, thus giving two images to be observed by the eye-piece. The distances between these images depend on the relative positions of the eye, the micrometer, and the object; and consequently, after the instrument has been graduated, all that is required to determine the apparent diameter of a heavenly body is to move the crystal backwards or forwards till the two images appear to touch, and the graduation corresponding to the place of the crystal gives the required result. This form of micrometer has been improved by Arago, Dollond, and others. Besides the instruments here mentioned many other micrometers exist.

Microscopium. See CONSTELLATION.

Mid. Abbreviation for *midshipman*.

Mid-channel. The middle part of a channel.

Middle Latitude. With reference to two places situated in the same hemisphere, the middle latitude is the latitude of the parallel passing midway between them; its value is therefore half the sum of the latitudes of the two places.

MIDDLE-LATITUDE SAILING. An approximate method of solving certain cases of spherical sailing, founded on the consideration that the arc of the parallel of middle latitude of two places intercepted between their meridians is nearly equal to the departure.

Middle Timber. That timber in the stern which is placed amidships.

Middle Watch. The period from midnight to 4 A.M. The men on watch during that time.

MIDDLE-WATCHER. A light meal taken by the officer of the middle watch.

Middleton, Edward, Rear-Admiral U.S.N. Born in South Carolina. Appointed from South Carolina, July 1, 1828; frigate "Java," Mediterranean Squadron, October, 1828, to May, 1831; sloop "Vandalia," West India Squadron, 1831–33; receiving-ship, Brooklyn, 1833–34.

Promoted to passed midshipman, June 14, 1834; frigate "Constitution," Mediterranean Squadron, 1835–38; sloop "Marion," Brazil Squadron, 1839–42.

Commissioned as lieutenant, March 2, 1841; store-ship "Lexington," 1843–44; sloop "Plymouth," Mediterranean Squadron, 1844–45; frigate "Cumberland," Home Squadron, 1846; steamer "Princeton," 1847–49; store-ship "Erie," 1849; navy-yard, Philadelphia, 1849–51; razee "Independence," Mediterranean Squadron, 1852; receiving-ship, New York, 1853; executive-officer of sloop "Decatur," Pacific Squadron, 1854–56; operating against a combination of hostile Indians of the various tribes of Washington and Oregon Territories during the war of the winter of 1854–55; attacks upon Seattle, Washington Territory, January 26, 1856.

Commissioned as commander, April 16, 1856; commanding sloop "Decatur," 1856–57; commanding steam-sloops "St. Mary's" and "Saranac" at different times, Pacific Squadron, 1861–65.

Commissioned as captain, April 24, 1863; special duty, New York, 1866; navy-yard, Mare Island, Cal., 1867–68; commanding steam-sloop "Pensacola," Pacific Squadron, August 27, 1868, to January 7, 1869.

Commissioned as commodore, November 26, 1868; commanding steam-sloop "Lackawanna," Pacific Fleet, February 6, 1869; commandant navy-yard, Pensacola, Fla., June 1, 1870, to March 8, 1873.

Commissioned as rear-admiral, August 15, 1876. Retired, December 11, 1872.

Middy. An abbreviation for *midshipman.*

Mid-feather. A water-bridge in the rear of the furnace of a steam-boiler, in a mid-position in the flue-space to enable the flame to pass above and below it; object, to increase circulation.

Midshipman. This term originated from the place assigned to the "young gentlemen," as they used to be called, amidships, or abreast of the mainmast.

In the larger class of vessels which, in the old build, had immensely high forecastles, quarter-decks, and round-houses, there were no means of going from the quarter-deck to the forecastle without descending into the waist; hence messengers were necessary in order to prevent the captain, or the officer of the watch, from having thus, in a measure, to desert his station, and these messengers took the orders from the officer at the break of the quarter-deck, and carried them to the forecastle, and likewise brought the various reports from the officers stationed forward to those in command abaft, and thence from their station were called *midshipmen.* It was from this class and that of quartermaster in the British navy that the master's mates were generally taken, as the contact into which they were naturally thrown with their superior officers led to this distinction when their conduct was meritorious; the promotions from the class of midshipman were much more numerous than those from the class of quartermaster, the former being necessarily selected from active, smart young men, while the latter were taken from the thoroughbred old tars. This patronage invested in the captains of ships of war gradually led to the sons of persons of respectability being appointed to these stations, whence with a slight degree of interest they were advanced to superior rank. Later, a set of youngsters was introduced into the British service by what is called a "king's letter." These were called "king's letter boys," and were but little relished by the rougher class of their associates for having, as they termed it, "Come in at the cabin windows instead of at the hawse-holes."

The midshipmen at first messed with the ship's company, having one or more tables given them on the lower deck, according to their number. They afterwards, in some vessels, had the heart of one of the cable tiers—quite a roomy place when hemp-cables were in vogue—given them as a mess-place, the quartermasters and boatswains' mates having the other. Those midshipmen or master's mates in whom the captain or officers took an interest were occasionally invited to their table, and in process of time the custom became general. See ACADEMIES, NAVAL.

MIDSHIPMAN, PASSED, is a midshipman who had passed an examination entitling him to promotion to a lieutenant whenever there occurred a vacancy in that grade. Since the title of ensign has been adopted, graduates of the U. S. Naval Academy waiting promotion to the grade of ensign are styled midshipmen, while undergraduates are called cadet-midshipmen.

In October, 1819, a board of senior captains, of whom Commodore Wm. Bainbridge was the president, was ordered by the Secretary of the Navy to convene at New York to examine midshipmen for promotion. This was the first examination instituted in our navy. It has continued ever since, and was the origin of the title "passed midshipman."

MIDSHIPMAN'S NUTS. Broken pieces of biscuit as dessert.

MIDSHIPMAN'S ROLL. A slovenly method of rolling up a hammock transversely, and lashing it endways by one clew.

Midships. The middle part of the vessel, either with regard to her length or breadth.

MIDSHIP BEND, or MIDSHIP FRAME. The frame of the ship which is the most capacious.

Mile (Lat. *mille passus*, a thousand paces). The common mile is the *statute* mile so called, from being incidentally defined in a statute of Queen Elizabeth. The *geographical*, *nautical*, or *sea*-mile is the mean length of a minute of latitude, and hence is sometimes called a *minute.* The length of the statute mile is 5280 feet; that of the nautical mile, 6082.66 feet; therefore one nautical mile = 1.1515 statute miles, and one statute mile = .8684 nautical mile. The kilomètre is sometimes called a *metrical* mile, and its length is equal to 1093 yards.

Military Law may be defined as a rule of conduct for military persons prescribed by the legislative power in a state, commanding what is to be done, and prohibiting the contrary.

In the United States, military law is principally expressed in Articles of War enacted by Congress pursuant to authority vested in it by the Constitution (Art. I. Sec. 8) "to make rules for the government and regulation of the land and naval forces." To this principal code is, however, to be added a body of regulations formulated by the Executive and ratified by Congress. These two, the Articles of War and the Army Regulations, taken together, constitute the written military law of the United States. What is known as the "custom of war" forms the unwritten part of the law military, and its aid is sought to explain doubtful questions arising in the course of procedure in military tribunals. The custom appealed to must be that of our own service, must be certain and well defined, and must not contravene any portion of the written military code.

Naval law has the same source and authority as military law, is constructed on the same principles, and is similarly administered, the points of divergence being mainly such as necessarily result from the differing spheres of action of the land and naval forces. See COURTS-MARTIAL, JUDGE-ADVOCATE, JUDGE-ADVOCATE-GENERAL, MARTIAL LAW, MUTINY ACT, OATHS.

Milky-way. See GALAXY.

Miller. *To drown the miller*, to put an extra quantity of water into grog. A fish of the genus *Myliobatis.*

Miller's Thumb. A fresh-water fish, the *Cottus cataphractus.*

Milt. The soft roe, or spermatic part, of the male fish.

Milwaukee, the most populous town of Wisconsin, is situated on the west shore of Lake Michigan, at the mouth of Milwaukee River, in lat. 43° 3′ 45″ N., lon. 87° 57′ W. The Menomonee River joins the Milwaukee about half a mile from its mouth, and the largest boats of the lakes can ascend the Milwaukee 2 miles from its mouth, as also the Menomonee for some distance from its confluence with the Milwaukee. The city has now one of the best harbors upon the whole chain of lakes. This city is the outlet and shipping port of a rich and rapidly improving country, and is said to be the greatest primary wheat-market in the world. Steamers run across the lake during the whole year. Six railroads centre here, the Chicago, Milwaukee and St. Paul, Chicago and Northwestern, Detroit and Milwaukee, Milwaukee, Lake Shore and Western, Western Union, and Wisconsin Central. Pop. 130,000.

Mine, Submarine. A defensive torpedo. See TORPEDO.

Minion. An old 4-pounder gun about 7 feet long. Its point-blank range was 120 paces, with a random one of 1500. Bourne, in 1578, mentions the minion as requiring shot 3 inches in diameter.

Minister. In affairs of state the designation of two classes of functionaries. The first of these embraces those officials who preside over the administrative departments of public business, and who in most countries form what is generally known as the "cabinet" of the executive head of the government. In the United States these officers are officially known as "secretaries."

The other class of public servants known as ministers are diplomatic agents accredited to the sovereigns or chief executives of foreign states. In the diplomatic service of the United States two grades of ministers exist, the higher being designated *ministers plenipotentiary*, and the lower *ministers resident.*

Minnow. A small fresh-water fish,—the *Leuciscus phoxinus.*

Minor Planets. See PLANETS, MINOR.

Minute. The sixtieth part of an hour. The sixtieth part of a degree. A nautical mile is sometimes called a *minute*, as being the mean length of a minute of latitude.

MINUTE-GUNS. Guns fired at an interval of a minute, as a mark of respect, on the death of a high official.

Mira. A remarkable variable star, *o Ceti.*

Mirach. A name given each of the stars β *Andromedæ* and ϵ *Boötis.*

Mirage. An optical illusion very common at sea, especially in high latitudes, and sometimes also witnessed on land, particularly in Lower Egypt, Persia, Tartary, the western plains of the United States, and on the margin of rivers or lakes, or on the sea-shore. It arises from unequal refraction in the lower strata of the atmosphere, and causes remote objects to be seen double, as if reflected in a mirror, or to appear as if suspended in the air. When the effect is confined to apparent elevation, the English sailors call it *looming;* when inverted images are formed, the Italians give it the name of *Fata Morgana.* Ships in the whale-fisheries are often descried and sometimes recognized by means of the mirage at considerable distances. Capt. Scoresby, while cruising off the coast of Greenland in 1822, recognized his father's ship at the distance of more than 30 miles, and consequently when below the horizon, by its inverted image in the air, though he did not previously know that it was cruising in that part of the fishery. A very remarkable case of mirage occurred at Hastings, England, on the 26th of July, 1796, when the French coast, 50 miles distant and extending from Calais to near Dieppe, was distinctly visible for the space of three hours.

Mirfak. The star α *Persei.*

Mirkles. The radical leaves of the *Fucus esculentus.*

Mirzam. The star β *Canis Majoris.*

Misrepresentation. Misrepresentation to the underwriters of any fact or circumstance material to the risk of insuring, whether fraudulent or not, and whether by the insured or his agent, renders the contract null and void.

Miss Stays. To fail to get around in tacking ship, whether from the bad working qualities of the vessel, the lightness of the wind, or the carelessness or inexperience of the officer in charge of the deck.

Mist. Visible vapor suspended in the air near the surface of the earth; a light fog.

Mistico. Equivalent to *hermaphrodite*, being a small Mediterranean vessel, between a xebec and a felucca.

Mistral. A cold northwest wind experienced on the Mediterranean shores of France.

Mitre. The joining of two pieces together so that when connected the joint shall make an angle with the side of each piece that shall be common to both.

Mizar. A name given to each of the stars β *Andromedæ*, ϵ *Boötis*, and ς *Ursæ Majoris.*

Mizzen. A term which distinguishes the

mast next abaft the mainmast, and the yards, sails, and rigging belonging thereto. The name is sometimes given to the spanker. The lower yard across the mizzen-mast is called the *cross-jack* yard.

MIZZEN MAST-MAN. A man stationed to attend to the gear of the mizzen-mast. See MAST-MAN.

MIZZEN-ROYAL. See ROYAL.

MIZZEN STAY-SAIL. A sail which hoists on the mizzen-stay.

MIZZEN-TOP. See TOP.

MIZZEN-TOPGALLANT. See TOPGALLANT.

MIZZEN-TOPMAST. See TOPMAST.

MIZZEN-TOPSAIL. See TOPSAIL.

Mobile, Ala. (port of entry), is situated on the west bank of the Mobile River, at its entrance into the bay of the same name, in lat 30° 41′ 48″ N., lon. 87° 59′ W. It is the most important city in the State, and ranks third as a cotton-market in the United States. It has an advantageous position for trade, being the natural outlet of the greatest cotton region in the United States. The harbor has been improved by the government, and it will now admit vessels drawing 13 feet of water to the wharves. The total value of foreign exports in the year 1877 was $12,812,-066, and that of foreign imports $648,404. Pop. 42,000.

Mocha. The most strongly fortified seaport, and once the capital, of the province of Yemen, in Arabia. It is situated on the Red Sea, at the head of a little bay, near the Strait of Bab-el-Mandeb, 130 miles W.N.W. of Aden.

Model. A model of a ship is the exact shape of the ship intended to be built, and is made to a scale. It is sometimes made solid or in one piece, but generally in horizontal pieces, for the convenience of taking off the lines from all the parts.

Moderate Breeze. A breeze blowing from 8 to 12 miles per hour; it is denoted by 4 on the Beaufort scale.

Moidore. A former gold coin of Portugal, equal to 4800 reis; called also *Lisbonine.*

Moist Daughters. Spenser's term for the Hyades, a group of seven stars in the head of the Bull. See HYADES.

Moke. The mesh of a fishing-net.

Mold. The matrix in which an object is cast. A pattern by which an object is shaped. In founding, molds are made in green sand, dry sand, or loam.

MOLDED. The size of a timber the way the mold is applied. The opposite of *sided.*

MOLDED BREADTH. The greatest breadth of a ship to the outside of the frame-timbers.

MOLDER'S CLAMP. A frame which holds together the parts of a flask.

MOLD-FACING. A fine powder sprinkled over the pattern before it is covered with loam.

MOLDING. The marking out of the ship's timbers by the use of the molds made in the mold-loft, by placing the molds and bevels upon each separate piece, and lining it into the shape of the mold.

MOLDING-BOARD. The board on which the pattern lies when ramming the loam.

MOLDING-EDGE. The edge which is traced by the molds from which the bevels are applied in order to obtain the required shape of the timber.

MOLDING-LOAM. A mixture of sand and clay used in molding.

Mole. A massive work of solid masonry extending into the sea to defend a port from the violence of the waves; also, sometimes, the harbor itself.

Mole-bat. A clumsy fish of the genus *Orthagoriscus;* the short sun-fish.

Mollusks (Lat. *mollis*, soft). The name applied by Cuvier to the great primary division of the animal kingdom, which includes all those species having a gangliated nervous system, with the ganglions or medullary masses dispersed more or less irregularly in different parts of the body, which is soft and inarticulate. The pulmonary or branchial circulation is separate and distinct, but is aided by the direct propulsion of a heart in one class only. There is always a heart for the systematic circulation, and it mostly consists of one ventricle and one auricle. Some of the mollusks breathe air, but the greater part respire through the medium of salt or fresh water. The blood of the mollusks is white or bluish. In one class only is there a rudiment of an internal skeleton giving attachment to a part of the muscular system; in the rest it is absent, and the muscles are attached to various points of the skin. Their contractions produce inflections and extensions of their different parts, and, alternating with relaxations, enable the species to creep, climb, swim, burrow, and seize upon various objects, according as the form of these parts may permit; but as the locomotive organs are not supported by articulated and solid levers, the mollusks cannot leap or advance rapidly on dry land. Many of the aquatic species are encumbered with a heavy shell. Nearly all the mollusks have an extensive fold of the skin reflected over their body, which it covers like a mantle; it is sometimes produced into a breathing pipe, or extended and divided in the form of fins. When the mantle is simply membranous or fleshy, or when a horny or testaceous rudiment of a shell is developed, but remains concealed in the substance of the mantle, the mollusk is said to be *naked.* When the shell is so much enlarged that the contracted animal finds shelter beneath or within it, the species is said to be *testaceous.* In many of the mollusks the shell is composed of a single piece, which is usually a spiral tube, closed at one end and gradually increasing in size towards the open extremity, from which the animal is able to protrude itself. Shells of this description are called *univalves.* In others the shell is composed of two pieces or valves, attached to each other at one point by a hinge, which is furnished with an elastic ligament that serves to open the valves when it is not opposed by the action of the *abductor* muscles, whose office it is to keep the shell closed. Shells of this kind are termed *bivalves.* These differences in the character of the shells correspond with differences in the conformation of the animals inhabiting them. The bivalve mollusks exhibit no traces of a head, and hence are termed *Acephalous* mollusks; while the univalves have a distinct head, provided with organs of the special senses, and hence, by way of distinction, some writers have termed them *Cephalophora* (head-bearing).

Molly-mawk. A small kind of albatross which follows in the wake of a ship rounding the Cape.

Moneres. Galleys with but one rank of oars.

Money.

United States of America.

10 mills = 1 cent.
10 cents = 1 dime.
10 dimes = 1 dollar.
10 dollars = 1 eagle.

Argentine Confederation.

100 centesimos = 1 dollar or patacon = $1.00.
17 patacons = 1 doubloon.

Austria.

100 kreutzers = 1 florin = $0.47.

Belgium. See France.

Brazil.

Mil reis = $0.50. See Portugal.

British India.

12 pies = 1 anna.
16 annas = 1 rupee = $0.48.
15 rupees = 1 mohur.
Lac of rupees = 100,000 = £10,000.
Crore of rupees = 10,000,000 = £1,000,000.

Burmah.

4 great rweh (rees) = 1 bais = $0.03.
4 bais = 1 math.
4 maths = 1 tical or kyat.

Canada.

Accounts are kept in dollars and cents, and also in pounds, shillings, and pence. See United States, Great Britain.

Cape of Good Hope. See Great Britain.

Chili.

100 centavos = 1 dollar = $0.90.

China.

10 cash = 1 candareen (fun).
10 candareens = 1 mace (tsien).
10 mace = 1 tael (lëang).
Among foreigners 1000 cash (about) = 1 dollar = $1 00.

The only native coin in use in China is the *tsien*, called *cash* by the English, and *sapeque* by the French, who derive it from the Portuguese *sapeca*. It bears on one side the name of the province in which it is cast, in Manchu letters, and also the Chinese word "money"; and on the other side the name of the reigning emperor, and above and below the words "current money," in Chinese characters.

Spanish, Mexican, South American, and United States trade dollars, though not acknowledged by the government, are employed as a commercial medium throughout the maritime provinces and at the interior treaty ports. Lumps of stamped silver, called *sycee*, pass current at a fixed standard of purity.

The nominal moneys of account are the *lëang*, *tsien*, *fan*, and *li*, called by foreigners *tael*, *mace*, *candareen*, and *cash*, the proportion of which, one to the other, is decimal; but, from various causes, there is great diversity in the number of cash given in exchange for the *tael*. The terms *tael*, *mace*, *candareen*, and *cash* are merely denominations of weight.

The circulating medium, in transaction with foreigners at the open ports, is chiefly in whole or broken dollars, "clean" or "chopped"; and the value of the dollar in relation to the tael is variable, the latter being approximately one-third more.

Denmark.

96 skillings = 1 daler or rixdaler = $0.53.

Egypt. See Turkey.

France.

100 centimes = 1 franc = $0.193.
20 francs = 1 napoleon or louis.

Germany.

10 pfennings = 1 groschen.
10 groschen = 1 mark = $0.235.

Gibraltar.

16 quartos = 1 real.
12 reals = 1 dollar = $1.00.
100 cents = 1 dollar.
10 decimas de real vellon = 1 real de vellon.
20 reals de vellon = 1 dollar = $1.00.
100 reals de vellon = 1 doblon.

Great Britain.

12 pence = 1 shilling.
20 shillings = 1 pound = $4.8665.

Greece.

100 lepta = 1 dracham = $0.193.

Holland.

100 cents = 1 guilder or florin = $0.40.

Italy.

100 centimes = 1 lira = $0.193.

Japan.

10 rin = 1 sen.
100 sen = 1 yen = $1.00.

Mexico.

100 cents = 1 dollar = $1.00.

Norway.

24 skillingen = 1 mark or ort.
5 marks = 1 species-daler = $1.07.

Portugal.

400 reis = 1 cruzado.
480 reis = 1 cruzado novo or pinto.
1000 reis = $1.08.
4500 reis = £1.

Russia.

100 copecks = 1 silver rouble = $0.75.
10 roubles = 1 imperial.
The paper rouble = $0.60 (about).

Siam.

200 to 450 cowries or bier = 1 p'hainung.
4 p'hainungs = 1 fuang.
2 fuangs = 1 salung or miam.
4 salungs = 1 tical.
4 ticals = 1 tamlung = $2.40.

Spain.

100 centimos = 1 peseta = $0.19.

Sweden.

100 öre = 1 riksdaler = $0.27.

Turkey.

40 paras = 1 piastre.
100 piastres = 1 medjidie or lira turca = $4.32.

Money-bound. A phrase expressive of such passengers as are detained on board till a remittance arrives for paying the passage made.

Monger. A fishing-vessel of small size.

Monitor. A vessel of war designed by Ericsson. See Ironclads.

Monk, George, Duke of Albemarle. Born in Devonshire, England, December 6, 1608. After spending the earlier years of his life in the service of Holland, he entered the English army at the age of 30, attaining the rank of lieutenant-colonel in the war against the Scots in 1639. During the Irish rebellion (1642) he was colonel of Lord Leicester's troops sent to crush it. When the civil war began he was supposed to favor Parliament, and was imprisoned, but soon after released. In 1644 he was defeated and captured by Fairfax. After two years' imprisonment in the Tower, he was liberated on his swearing to

the Covenant. He was then given the command in the north of Ireland. Cromwell having a high opinion of his military ability, made him his lieutenant-general and chief of artillery; and for extraordinary services rendered at the battle of Dunbar he was promoted to commander-in-chief of the army in Scotland. It required in those days but a small amount of professional training to convert a general into an admiral, so in 1653 we find Monk in command of a division of the fleet of Admiral Blake, consisting of 100 ships, with which he defeated Admiral Van Tromp off Nieuwpoort. He also fought with him again off Katwijk, in which battle Van Tromp was killed. In 1654 he was made governor of Scotland, his principal residence being at Dalkeith, where he lived until the death of Cromwell, when seeing everything in confusion, and regarding his own position as perilous, he crossed into England with 6000 men in January, 1660, and uniting his troops with those which Fairfax had collected for Charles II., he entered London unopposed, although as yet he had kept his views profoundly secret. On the 21st of February he called together the remaining members of the Parliament, and Charles II. being presently recalled, Monk was made Duke of Albemarle, and intrusted with the highest offices in the state. In 1666 we again find him at sea, as second in command of the fleet sent against the Dutch. He was defeated by De Ruyter in a sea-fight off Dunkirk, but soon after gained a bloody victory over him off North Foreland. He died January 3, 1670.

Monk-bag. A small bag strung around the neck, in which sailors keep their money. See BAG.

Monkey. A heavy weight which acts by the force of gravity, as in driving piles, etc.

Monkey-boat. A half-decked boat above-bridge on the Thames. A small boat used about docks.

Monkey-block. A small swivel-block used as a leader for running rigging.

Monkey-jacket. A short, close-fitting coat worn in cold weather.

Monkey-pump. Straws or quills for sucking the liquid from a cask, through a gimlet-hole made for the purpose,—a practice as old as the time of Xenophon, who describes this mode of drinking from the prize jars of Armenia.

Monkey-spars. Small masts and yards for a vessel devoted to the instruction and exercise of boys.

Monkey-tail. A lever for training a carronade.

Monkey-wrench. A wrench with an adjustable jaw, usually worked by a screw.

Monk-fish. The *Squatina angelus*.

Monk-seam. The seam made after sewing the edges of sails together, one over the other, by stitching through the centre of the seam. Also, the fash left at the junction of the molds when a ball is cast.

Monmouth Cap (*Eng.*). A flat worsted cap formerly worn by soldiers and sailors.

Monoceros. See CONSTELLATION.

Monoxylon (*Gr.*). Boats in the Ionian Isles propelled with one oar.

Monsoon (Malayan, *musim*) is derived from the Arabic word *mausim*, a set time or season of the year, and is applied to those winds prevailing in the Indian Ocean which blow from the southwest from April to October, and from the opposite direction, or northeast, from October to April. The existence of these winds was made known to the Greeks during the Indian expeditions of Alexander, and by this knowledge Hippalus was emboldened to sail across the open sea to Muzeris, the emporium of Malabar. The monsoons depend, in common with all winds, whether regular or irregular, on the inequality of heat at different places and the earth's rotation on its axis; but more particularly they are occasioned by the same circumstances which produce the trade-winds and the land- and sea-breezes, being, in fact, the combined effect of these two sets of causes.

If the equatorial regions of the earth were entirely covered with water, the trade-winds (see TRADE-WINDS) would blow constantly from the northeast in the north, and from the southeast in the south torrid zone, with a belt of variable winds and calms interposed; the whole system, following the sun's course, moving northward from December to June, and southward from June to December. But, especially in the eastern hemisphere, large tracts of land stretch into the tropics, and give rise to the extensive atmospheric disturbances for which those parts of the earth are so remarkable. During the summer half of the year, the north of Africa and the south of Asia are heated to a higher degree than the Indian Ocean, while Australia and South Africa are much colder. As the heated air of Southern Asia expands and rises, and the colder air from the south flows in to supply its place, a general movement of the atmosphere of the Indian Ocean sets in towards the north, thus giving a *southerly* direction to the wind; but as the air comes from those parts of the globe which revolve quicker to those which revolve more slowly, an easterly direction will be communicated to the wind; and the combination of these two directions results in the southwest monsoon, which prevails there in summer. Since, during winter, South Asia is colder than the Indian Ocean, which, again in its turn, is colder than South Africa, a general motion of the atmosphere sets in from the south and west. As this is in the same direction as the ordinary trade-wind, the effect in winter is not to change the direction, but only to increase the velocity of the trade-wind. Thus, while south of the equator, owing to the absence of sufficiently large tracts of land, the southeast trade-winds prevail throughout the year; on the north of the equator we find the southwest monsoon in summer and the northeast in winter, it being only in summer and north of the equator that great changes are effected in the direction of the trade-wind.

Similar, though less strongly marked monsoons prevail off the coasts of Upper Guinea in Africa and Mexico in America. The east and west direction of the shores of these countries, or the large heated surfaces to the north of the seas which wash their coasts, produce, precisely as in the case of South Asia, a southwest monsoon in summer. As might have been expected, the monsoon off the coast of Mozambique is easterly, and that off the coast of West Australia northwesterly. The trade-winds also suffer considerable change in their direction on the coasts of Brazil, Peru, Lower Guinea, etc. These, though

sometimes considered monsoons, are not truly such, for they do not change their directions periodically, so as to be opposite to each other, like true monsoons, but only veer through a few points of the compass.

In April, the northeast monsoon changes into the southwest, and in October the southwest into the northeast. These times depending on the course of the sun, and consequently varying with the latitude, are called the "breaking up" of the monsoons, and are generally accompanied by variable winds, by intervals of calm, and by furious tempests and hurricanes.

Monsoons, when compared with the trade-winds, will be found to play a most beneficial and important part in the economy of the globe. Their greater velocity, and the periodical changes which take place in their direction, secure increased facility of commercial intercourse between different countries. But the full benefits following in their train are not seen unless they be considered in their relation to the rain-fall of Southern Asia. Indeed, the fertility of the greater part of this fine region is entirely due to the monsoons, for if the northeast trade-wind had prevailed there throughout the year, Central and Western India, and many other places, would only have been scorched and barren saharas. The rain-fall of India depends entirely on the monsoons. The coast of Malabar has its rainy season during the southwest monsoon, which brings thither the vapors of the ocean. On the Coromandel coast, on the other hand, it is the northeast monsoon which brings the rain from the Bay of Bengal. The two coasts of Hindostan have therefore their seasons reversed, the dry season of one corresponding with the wet season of the other.

Monte Pagnote. In former days an eminence out of cannon-shot of operations, where spectators were not exposed to danger.

Montevideo, a seaport city and capital of the republic of Uruguay, is situated on a peninsula in the estuary of the La Plata, in lat. 34° 53′ S., lon. 56° 15′ W. Its port, open to the southwest, is the best on the Plata. The principal exports are hides, beef, hair, feathers, Chilian copper, and Paraguayan tea. Pop. 92,000.

Montgomery, John B., Rear-Admiral U.S.N. Born in New Jersey. Midshipman, June 4, 1812; lieutenant, April 1, 1818; commander, December 9, 1839; captain, January 6, 1853; commodore, July 16, 1862; rear-admiral (retired list), July 25, 1866; served on Lake Ontario, in attack on Kingston, Canada, November 10, 1812; capture of York, April 27, and of Fort George and Newark, May 27, 1813; in the "Niagara" in Perry's victory on Lake Erie, September 10, 1813 (receiving a sword and the thanks of Congress); in Decatur's squadron in the Mediterranean in 1815, and participated in the capture of Algerine frigate and brig, and blockade of Algiers; commanded sloop "Portsmouth," Pacific Squadron, 1845–48. During the cruise of the "Portsmouth" in the Pacific, he took possession of California, and blockaded Mazatlan some months. In October, 1847, he, with Capt. Lavalette, in the "Congress," captured Guayamas, on the Gulf of California; commanded Pacific Squadron, 1860–61.

Month. Originally, the period of the moon's revolution round the earth. If this is reckoned from the position of the moon among the stars to her return to the same position, the period is called a *sidereal* month, and consists of $27^d\ 7^h\ 43^m\ 11\frac{1}{2}^s$; but if from new moon to new moon, it is longer, being $29^d\ 12^h\ 44^m\ 3^s$; this is called a *synodic* month. There are several other periods used by astronomers to which this name is applied, as the *tropical* or *periodic* month ($27^d\ 7^h\ 43^m\ 4.7^s$), reckoned from the moon's passing the equinox till her return to the same point; the *nodal* month ($27^d\ 5^h\ 5^m\ 29^s$), from ascending node to ascending node; the *anomalistic* month ($27^d\ 13^h\ 18^m\ 37^s$), from perigee to perigee; and the *solar* month, which is the twelfth part of a solar year, consisting of $30^d\ 10^h\ 29^m\ 4^s$. Distinct from these is the *civil* or *calendar* month, fixed by law for ordinary purposes, and consisting of a fixed number of days,—from 28 to 31.

Monthly Allowance. A sum paid monthly to seamen, marines, and boys serving on board.

Montreal, the commercial metropolis of the Dominion of Canada, is situated on the island of Montreal, in the St. Lawrence River, in lat. 45° 31′ N., lon. 73° 34′ W. It is at the head of ocean navigation, and at the commencement of lake and river navigation. The harbor, which is formed towards the St. Lawrence, is secure, and improvements are being made every year to accommodate the large increase of shipping. Among the manufactories are foundries of iron, distilleries, breweries, sugar-refineries, manufactories of hardware, carriages, locomotives, steam-engines, etc. Pop. about 115,000.

Montrose. A seaport town of Scotland, in lat. 56° 42′ 30″ N., lon. 2° 28′ W. The harbor is one of the best on the east coast of Scotland. It is formed by the entrance of the South Esk into the North Sea, and has good docks and quays. The quays and wet-dock are about $1\frac{1}{4}$ miles from the entrance of the river. The chief imports are flax, hemp, coals, etc., the exports manufactured goods, grain, and cattle. Pop. 15,000.

Moon. The earth's satellite. Diameter about 2214 miles; mean apparent diameter 32′; distance from the earth 240,000 miles. The light of the full moon is equal to about 1-800,000 that of the sun; the heat is about equal to that of a candle 15 feet distant. The moon always shows the earth the same face, with little variation; hence it is known that she turns on her axis just once during each revolution about the earth. But on account of oscillations and vibrations, called librations, small portions of the opposite face are occasionally seen, so that an observer on the earth is enabled in the course of time to see four-sevenths of the surface. The absence of twilight, the absence of refraction when the light of a star passes near the moon, and researches with the polariscope indicate that the moon has no atmosphere. Without air, water can exist in the form of vapor only; but there is no evidence even of vapor of water. Without air and water no form of vegetable or animal life can exist. Even if these conditions were satisfied, the slow rotation of the moon, alternately shutting off the sun's rays, and exposing plants and animals to their fierceness for two weeks at a time, would require organizations materially different from those found on the earth. See Weather, Tide.

Moon-blink. A temporary evening blindness occasioned by sleeping in the moonshine in

tropical climates; it is technically designated *nyctalopia*.

MOON-CULMINATING STAR. A star which comes to the meridian about the same time with the moon. The difference of the right ascensions of the moon and star are observed at two places; the change in the difference is the moon's proper motion; as the moon's proper motion is known, the difference of longitude can be thus determined.

MOON-FISH. A fish whose tail-fin is shaped like a half-moon.

MOON-RAKERS. Sails above the sky-sails. They are usually called *moon-sails*.

MOON-SHEERED. A ship the upper works of which rise very high, forward and aft.

MOON-STRUCK. An influence imputed to the moon in the tropics, by which fish, particularly of the *Scomber* class, though recently taken, become intenerated, and even spoiled; while some attribute poisonous qualities to them in this state. Human beings are also said to be injured by sleeping in the moon's rays.

Moor. To secure a ship with cables attached to two anchors, to a wharf, or to permanent moorings. To moor *head and stern*, to moor ship with one cable leading from the hawse-hole and others leading aft from the stern; from this position the ship cannot swing. To moor with an *open hawse*, to lay out the anchors in a line at right angles to the prevailing wind. *To moor across*, to lay out the anchors on each side of a stream. *To moor along*, to anchor in a river with a hawser on shore to steady the ship. To make a *flying-moor*, see MOORING.

MOORING-BRIDLE. The fasts attached to permanent moorings, and taken through the hawse-holes when mooring.

MOORING-POST. A heavy vertical timber in the ground or on a wharf, to which vessels are made fast by means of chains or hawsers.

MOORINGS. Heavy chains permanently anchored in a harbor; to them are attached buoys with chains of sufficient length and strength to heave the fast up the hawse-hole.

MOORING-SWIVEL. A device used to connect two chain-cables in such a manner that the swinging of the ship will not bring turns in the hawse,—the object being to avoid the trouble of tending ship and clearing hawse. Frequently, one of the chains is unshackled in order to facilitate veering. With the mooring swivel on, if a gale comes on in a line with the anchors, the vessel is in the same condition as if at single anchor, except that in case another anchor is to be let go, it must be the sheet. If the gale comes on at right angles to the line of the anchors, the anchors and cables are in the worst possible situation, it being impossible to alter the angle between the cables from the swivel to the anchors. See MOORING.

Mooring (Dutch *marren*, to tie; to fasten). Securing a vessel in a particular position by means of cables attached to the shore, or to her own anchors at the bottom of the anchorage. *To moor ship*, or simply "to moor," is generally understood to mean the letting go of a second anchor in such a relative position to the first that the vessel may ride between the two. It may be readily understood that a vessel riding to a single anchor and a good scope of cable would take up too much room in any ordinary harbor. Tending, moreover, to each change of tide, the cable would soon become wound about the upper fluke of the anchor, rendering it liable to trip in the first puff of wind that struck the ship. If, then, the ship is to remain some time in port, it is customary *to moor*. This is effected as follows: after letting go the first anchor (see ANCHORING) cable is veered to double the ordinary scope, paying out the chain gradually as the vessel drops astern, so that it may lie on the bottom in a straight line from the anchor. Anchored in 6 fathoms water, veer to, say 90 fathoms chain, and let go the second anchor. The first cable is then brought to the capstan and hove in 45 fathoms, veering meanwhile on the second, so that when the operation is completed the ship may be midway between the two anchors and have 45 fathoms on each chain. She will now swing in a very small circle and keep both anchors clear.

In the foregoing it is supposed that the tide enables the ship to drop into the proper position for letting go the second anchor. Should this not be the case, a steamer would effect the object by resorting to her engines, a sailing-vessel to her sails; or a kedge and hawser may be run out in order to haul the ship over to the desired place; or the anchor may be carried out by the ship's launch, as must be done when it is to be planted in shoal water. After mooring put on the *mooring-swivel* (which see).

A flying-moor is made on first anchoring by combining the two manœuvres in one. Standing in for the anchorage, let go the first anchor with good headway on, running out double the mooring scope and then letting go the other anchor, after which proceed as before. This method is rarely desirable, particularly with sailing-vessels.

In a tide-way a ship is moored with her anchors up and down the stream. In roads where there is little or no tide, they are generally placed at right angles to the quarter whence the strongest winds are expected. To be moored under the latter conditions, however, is not always desirable. For let a ship be riding to her anchors placed on an east and west line and a gale to come on from the northward, then is the ship riding to a span, and does not derive the full benefit of her two anchors. Should the wind haul to the eastward, the lee-anchor, being astern, or to the westward, is of no use at all. Should the mooring-swivel part, the ship is entirely adrift with the loss of both bowers. Should it become necessary to let go a third anchor, the swivel still holding on, and the wind haul to another quarter, there would be danger of the three cables becoming hopelessly fouled. These, among other reasons, induce many good seamen to lie at single anchor where admissible, and veer to a long scope on the approach of bad weather. If obliged to let go the second anchor, a good scope is veered on each chain, the ship in that case getting the full benefit of both. This is not "mooring," however. There is a prejudice, too, against the *mooring-swivel*, many seamen preferring to take the occasional trouble of *tending ship* (see TENDING SHIP) and *clearing hawse* (which see) when necessary. A vessel may be moored "head and stern" by dropping one, or both, bowers under foot, and then veering astern the proper distance, letting go both sheets, bringing the

cables in through the stern chocks or ports. This done, heave in to the proper scope on the bowers. Or she may veer away on her bow cables till her stern is within the proper distance of the shore, mole, or pier, and then secure to the latter by fasts (hawsers or cables, either of hemp or chain) run out astern.

To moor to a buoy, or fixed or stationary moorings. The latter are large buoys well anchored in convenient positions, to which ships may secure instead of anchoring. To one of these a ship may moor by shackling her chain to the ring fitted for the purpose. A vessel may also *moor* alongside of a wharf or dock.

To unmoor is simply to pick up one of the two anchors (generally the lee one) used in mooring in the stream. To pick up either anchor, it is necessary to veer away on one cable as the other is hove in. After weighing one anchor, heave in to the proper scope on the other cable. The term *unmooring* is applied almost exclusively to this case, never to that of a ship moored to a dock.—*S. B. Luce, Captain U.S.N.*

Moot. A gauge for sizing tree-nails.

Mop. A young whiting.

Moppat. An early name for the sponge of a cannon.

Mopusses. A cant-term for money in general.

Mormyrus. A Linnæan genus of malacopterygious fishes, resembling the pike, found only in the rivers of Africa.

Morning Gun. The gun fired from the flagship to announce daybreak.

Morning Star. See VENUS.

Morrhua. A genus of fishes, including the common cod.

Morris, Charles, Commodore U.S.N. Born at Woodstock, Conn., July 26, 1784. Entering the navy in 1799, he made his first cruise as a midshipman in the "Congress"; his next cruise was in the "Constitution" (1803–5), under the famous Commodore Preble, in the war against Tripoli; he was in the attack on the "Philadelphia" in the harbor of Tripoli, under Decatur, and was the first of the boarders on the deck of the captured vessel, and also participated in all the attacks on Tripoli in the following summer. The next four years were passed in a short cruise in the "Hornet" in European waters, and on duty enforcing the embargo of Jefferson at Portland, Me. From 1810 to 1812 he cruised in the "Constitution." Soon after his return to the United States, and while still executive-officer of the "Constitution," with Hull as captain, the war of 1812 broke out, and he was on that vessel when she made her famous escape from a British squadron, and in the fight between the "Constitution" and "'Guerriere" he was wounded through the body. Upon his recovery he was promoted to a captaincy and given command of the "Adams," which vessel he commanded until she was destroyed at Hampden to avoid capture by the British. After the establishment of peace with England, Morris commanded the "Congress," in the war against Algiers. Upon his return, and while still in command of the "Congress," he was sent on a mission to Hayti and San Domingo, where he conducted important negotiations for the State Department. In 1819–20 he was sent with a squadron to Buenos Ayres on a mission of political importance. On his return he was appointed a navy commissioner, which high position he held for many years. In 1825 he commanded the "Brandywine," the vessel which carried Lafayette back to France. After leaving France he made a tour of inspection of the naval stations of France and England, returning to his position of navy commissioner in 1827. This position he held until 1841, except during two years when he was in command of the Boston Navy-Yard. For some years after this he was on duty in Washington as chief of the Bureau of Ordnance, and died at the age of 72, in 1856, while on that duty.

Morris. A fish of the genus *Leptocephalus*, resembling the eel, but having a very slender body compressed so far as to be thin and flat, like tape.

Morris-pike. A formidable Moorish weapon, the precursor of the boarding-pike.

Morse. See WALRUS.

Morsing Powder. An old term for priming-powder.

Mort. A salmon in his third year.

Mortar. A short piece of ordnance with large bore, used for throwing shells at high angles in order to reach objects by their vertical fire. They are used in the navy only under exceptional circumstances, the one pattern used being the 13-inch of 17,000 pounds, made of cast iron.

MORTAR-VESSEL. A vessel fitted for carrying and working a mortar. To enable the mortar to be properly manœuvred and to resist the recoil, the vessel should have considerable breadth in proportion to her length. The mortar is slung amidships in a massive bed. The ancient form of mortar-vessel was the bomb-ketch, convenient because of the length of deck without a mast.

Mortised Block. A block of which the shell is made of a single piece mortised out to receive the sheave.

Moruach. A peculiar seal, which has been frequently mistaken for a mermaid.

Moscow is situated on the Moskva River, is the capital of the government of Moscow, and one of the most important cities of Russia. Lat. 55° 45′ 21″ N.; lon. 37° 34′ E. Manufactures of various kinds are carried on to a great extent within the city, the principal of which are for textile fabrics, chiefly woolen, cotton, and silk. The other principal articles are hats, hardware, leather, chemical products, beer and brandy. From its central position Moscow is the great entrepôt for the internal commerce of the empire. Great facilities for this commerce are given by water communication, which extends on one side to the Baltic, on another to the Caspian, and on a third to the Black Sea, and by the important railways which centre here. Pop. 602,000.

Moses. A flat-bottomed boat used in the West Indies for bringing off hogsheads of sugar; it is termed single or double according to its size.

Moses' Law. The term among pirates for inflicting 39 lashes on the bare back,—forty save one.

Moses-seam. See MONK-SEAM.

Mosquito Fleet. An assemblage of small craft.

Moss-bunker. A name for the *hard-head* (*Alosa menhaden*).

Motella. A genus of fishes, including the whistle-fish.

Mother Cary's Chicken. The stormy petrel, *Procellaria pelagica.*

Mother Cary's Goose. The name given by Captain Cook's people to an oceanic brown bird, *Procellaria gigantea*, which Pernety calls *quebranta-huesos* (bone-breaker).

Mother-of-pearl. The iridescent nacreous inner layer of several species of shells, especially the "pearl-oyster" (*Meleagrina margaritifera*).

Motion. The relation between two points in space when a straight line joining them is changed in length, or in direction, or in both; its unit of measure is one foot or one degree of arc.

MOTION, PROPER. The motion of a heavenly body due to its own movement as distinguished from its apparent change resulting from a change in the position of the spectator. The term is technically used for such motion of a body as is independent of the earth's diurnal motion. Thus, the proper motion of the sun is his motion in the ecliptic as distinguished from his apparent motion in a diurnal circle; the former is the result of the earth's motion in her orbit, as the latter is of her diurnal revolution.

Motor. A mechanical contrivance to utilize force; a prime mover, such as a steam-engine, a water-wheel, or an electro-magnetic machine.

Mount. To place a gun on its carriage. To carry; as, a ship mounts 44 guns.

Mountebank. The *Gammarus arcticus*, or arctic shrimp.

Mourning. In the navy mourning is denoted by half-masting the ensign, narrow-pennant, broad-pennant, or the flag of an admiral, and by the firing of minute-guns. (See FUNERAL HONORS.) In the merchant service the colors are half-masted and the yards topped up. In early days, on special occasions the sides were painted blue.

Mouse. A bunch raised on a piece of rigging by means of spun-yarn, parcelling, etc., to prevent a running-eye from slipping. *To mouse a hook*, to take several turns of small stuff around the point and back of a hook to prevent its unhooking.

MOUSING. The small stuff used to keep a hook from unhooking.

Mouth. The opening of a port or outlet of a river.

Moving-sands. Synonymous with *quicksands.*

Mud-digger. A light-draft vessel fitted with appliances for dredging out a harbor or channel. A dredging-machine.

Mud-dredger. See MUD-DIGGER.

Mud-fish. The *Lepidosiren*, a very remarkable fish of the Gambia and other African waters.

Mud-hole. A covered opening in the bottom of a boiler, for removing dirt and sediment.

Mud-hook. A familiar term for an anchor.

'Mudian, 'Mugian, or Bermudian. A boat special to the Bermuda Islands, usually decked, with the exception of a hatch; from 2 to 20 tons burden; it is short, of good beam, and great draft of water abaft, the stem and keel forming a curved line. It carries an immense quantity of ballast. Besides a long main- and short jib-boom, it has a long, tapering, raking mast, stepped just over the forefoot, generally unsupported by shrouds or stays; on it a jib-headed mainsail is hoisted to a height of twice, and sometimes three times, the length of the keel. This sail is triangular, stretched at its foot by a long boom. The only other sail is a small foresail or jib. They claim to be the fastest craft in the world for working to windward in smooth water, it being recorded of one that she made five miles dead to windward in the hour during a race; and though they may be laid over until they fill with water, they will not capsize.

Mud-lands. The extensive marshes left dry by the retiring tide in estuaries and river mouths.

Mud-larks. People who grovel about bays and harbors at low water for anything they can find.

Mud-lighter. A flat-bottomed boat which receives the mud or other matter from a dredging-machine.

Mud-plug. A tapered plug, in the lowest part of the bottom of a boiler, which can be conveniently removed to allow the escape of mud and sediment.

Mud-valve. A valve placed in a pipe connected to the bottom of the boiler, or in the bottom itself, for the removal of mud and sediment, —much used in Western river steamboats.

Muffle. To deaden the sound of; as, to muffle a drum. When necessary to deaden the sound of the oars, as on a night expedition, thrum-mats or pieces of canvas are wrapped around the looms of the oars in the wake of the rowlocks or tholepins. Whaleboats have their oars muffled to avoid frightening the whales.

Mufti. Citizen's clothes. Officers are required to wear their uniform when on board ship, or when on duty at a navy-yard. When on shore they may wear citizen's clothes or their uniforms; but no portion of the uniform must be worn with citizen's dress.

Muggy. Half intoxicated; a sheet in the wind. Also used to express damp, oppressive weather.

Mullany, J. R. Madison, Rear-Admiral U.S.N. Born in New York, October 26, 1818. Appointed from New Jersey, January 7, 1832; attached to frigate "Constellation," Mediterranean Squadron, from February, 1832, to December, 1834; receiving-ship, and Naval School, navy-yard, New York, from June, 1835, to April, 1836; frigate "United States," Mediterranean Squadron, from May, 1836, to December, 1837; schooner "Shark," Mediterranean Squadron, from December, 1837, to March, 1838; Naval School, navy-yard, Norfolk, from March, 1833, to June, 1838.

Promoted to passed midshipman, June, 1838; naval rendezvous, New York, from November, 1838, to August, 1839; brigantine "Dolphin," coast of Africa, from August, 1839, to September, 1840; receiving-ship and rendezvous, New York, from October, 1840, to December, 1841; steam-frigate "Missouri," Home Squadron, from December, 1841, to July, 1842; receiving-ship at New York, from July, 1842, to April, 1843.

Commissioned as lieutenant, February 29, 1844; brig "Somers," West Indies, from April, 1843, to April, 1844; brig "Washington," coast survey, deep-sea soundings, and observations for temperature in Gulf Stream, from July, 1844, to May, 1847; brig "Washington," Home Squadron, from May, 1847, to August, 1847; active service on the Mexican coast during the Mexican war; took part in the attack on and capture of the city of Tabasco, June, 1847; brig "Wash-

ington," coast survey, from September, 1847, to May, 1848, engaged in deep-sea soundings, and observations for temperature in Gulf Stream; sloop-of-war "St. Louis," Brazil Squadron, from June, 1848, to April, 1849; frigate "Brandywine," Brazil Squadron, from May, 1849, to December, 1850; receiving-ship at New York, from April, 1851, to September, 1851; gunboat "John Hancock," special service on coast of United States, and in West Indies to search for filibustering vessels, from September to October, 1851; receiving-ship at New York, from October, 1851, to September, 1852; frigate "Columbia," West India Squadron, from September, 1852, to April, 1855; inspector of ordnance, navy-yard, New York, from May, 1855, to May, 1858; brig "Arctic," special service, West Indies, from May to August, 1858; frigate "Niagara," as executive-officer, special service, coast of Africa, from September to December, 1858; frigate "Constellation," as executive-officer, fitting her for sea, April and May, 1859; frigate "Sabine," as executive-officer, West India Squadron, May, 1859, to December, 1860; frigate "Sabine," off Pensacola, commencement of war, from January to March, 1861, assisting in the protection of Fort Pickens; commanded gunboat "Wyandotte," April and May, 1861, occupying a position inside of the harbor of Pensacola, in rear of Fort Pickens, to aid in protecting it from a threatened attack from the enemy; assisted in towing in the boats and landing forces, composed of sailors and marines, April 12, 1861, reinforcing Fort Pickens; commanded store-ship "Supply," Home Squadron, May and June, 1861, off Pensacola, and during passage to New York; inspector of ordnance, Fort Pitt Foundry, Pittsburgh, and other places, from July, 1861, to March, 1862.

Commissioned as commander, October 18, 1861; commanded steamer "Bienville," North Atlantic and West Gulf Squadrons, from April, 1862, to May, 1865,—except as hereafter noted,—frequently engaged with, and coming under the fire of the forts off Charleston and other points on the Southern coast.

Arriving in command of the "Bienville" off Mobile shortly before the battle of August 5, 1864, volunteered his services for the engagement then being planned. The "Bienville" not being considered by Admiral Farragut a fit vessel to engage the forts, he was assigned by Admiral Farragut to the command of the "Oneida," which, on the passing of Fort Morgan, occupied the side exposed to the fire of the fort, the "Galena" being lashed to the opposite or port side, and being under his control by virtue of his seniority. The "Oneida" occupied the rear of the line of battle, and was exposed to a very destructive fire from Fort Morgan. The first shell by which she was struck entered the ship just under the mizzen rigging, killing the cabin steward, cutting the wheel-ropes, and setting the cabin on fire. The steering-gear being promptly repaired, the vessel was again struck, the shot exploding the starboard boiler and scalding 16 men. The "Oneida" was partly disabled by this shot, but steam on the port boiler was still available, and sufficed to move the ship.

As rearmost vessel, the ship was exposed to a very heavy fire for some time after she was able to return it, owing to the fact that she had passed too far beyond the fort to be enabled to train her guns sufficiently aft to bring them to bear on it.

When nearly free from the fire of Fort Morgan, the "Oneida" was assailed by the ram "Tennessee," with whom she exchanged shots in passing. The latter, coming up under her stern, was enabled to rake her, one shot visiting serious loss upon the ship, and inflicting several severe wounds upon Commander Mullany, one of which necessitated the amputation of his left arm.

Up to this time he had exercised active command of the two vessels, standing upon the poop and "conning" the ship, and encouraging the crew by voice and example. After this injury the vessel was not again struck, and the engagement, as far as the "Oneida" and "Galena" were concerned, terminated.

While commanding the "Bienville," off Charleston, 1862, captured steamers "Stettin" and "Patras," under English flag, loaded with munitions of war, vessels and cargoes valued in the aggregate at half a million dollars. Also captured 9 schooners from Nassau, all under English colors.

Commanded division of West Gulf Squadron, extending from Sabine Pass to Rio Grande, from April to September, 1863.

While in the "Bienville," off Galveston, Texas, sent in boat expedition, and captured and brought off two schooners with 576 bales of cotton.

Inspector in charge of ordnance at navy-yard, New York, from May, 1865, to May, 1868.

Commissioned as captain, July 25, 1866; special duty as one of Board of Visitors to Naval Academy, May and June, 1868; special duty on board to select sites for powder-magazines, Portsmouth, N. H., Boston, and New York, June and July, 1868; court-martial duty at New York, August, 1868; commanded sloop "Richmond," European Squadron, December, 1868, to November, 1871.

Commissioned as commodore, August 15, 1870; commanded Mediterranean Squadron, European Fleet, from October, 1870, to November, 1871; occasional court duty from November, 1871, till September, 1872; commanded navy-yard, Philadelphia, from October, 1872, to June, 1874; in addition to which, commanded Naval Station, League Island, from April, 1873, to June, 1874.

Commissioned as rear-admiral, June 5, 1874; commanded North Atlantic Station from June, 1874, to February, 1876; during this period was engaged with portion of squadron at New Orleans from September, 1874, to March, 1875, acting in co-operation with Gen. Emory, and afterwards with Gen. Sheridan; in September and October, 1875, was at Aspinwall with his flagship and one other vessel of squadron, to protect American interests on the Isthmus, then menaced by the rebellion in the state of Panama. Was authorized by Navy Department at this time to command for the purpose the vessels of the South Pacific Squadron, then in the harbor of Panama, consisting of the flag-ship "Richmond" and the "Omaha"; Naval Asylum and station, Philadelphia, as governor, from March 1, 1876, to October 26, 1879, when he was retired.

Mulet. A Portuguese craft with three lateen-sails.

Mullet. A well-known fish, of which there are several species. The gray mullet, *Mugil*

capito, and the red mullet, *Mullus surmuletus*, are the most common.

Mulls. The nickname of the English in Madras, from mulligatawney having been a standard dish among them.

Mulrein. A name in the Firth of Forth for the frog-fish, *Lophius piscatorius*.

Multiple Star. When several stars appear in close proximity to each other they are spoken of, collectively, as a multiple star.

Multi-tubular Boiler. A boiler in which the water passes through a large number of tubes of small diameter. Object, rapid circulation and increased generation of steam.

Mumbo Jumbo. A strange minister of so-called justice on the Gold Coast, who is usually dressed up for the purpose of frightening women and children. He is the arbiter of domestic strife.

Mummy-chog. A small fish of the carp kind.

Munduc. A sailor employed in the pearl-fishery, to haul up the diver and oysters.

Mundungus (from the Spanish *mondongo*, refuse, offal). Bad, rank, and dirty tobacco.

Munition. Military or naval stores of every description. *Munition ships* are vessels which carry military and naval stores, and attend or follow a fleet to supply ships of war.

Munjak. A kind of pitch used in the Bay of Honduras for vessels' bottoms.

Munnions. Pieces placed up and down to divide the panels in framed bulk-heads.

Muræna. An eel-like fish, very highly esteemed by the ancient Romans.

Mural Circle. A circle of metal, which, as it turns on a pivot, keeps the telescope always in the meridian; the circle is accurately graduated on its rim. When the telescope is horizontal, a stationary index points to zero on the circle; as the telescope is moved a portion of the circle passes by the index, which thus shows the amount of elevation.

Murderer. The name formerly used for large blunderbusses, as well as for those small pieces of ordnance which were loaded by shifting metal chambers placed in the breech.

Murex (Lat. *murex*, a shell-fish). A name applied by Linnæus to a genus of gasteropodous mollusks having a univalve spiral shell, with an oval aperture ending in an entire, straight, or slightly ascending canal. The mollusks thus characterized form a family (*Muricidæ*, or rock-shells), belonging to the order *Pectinibranchiata* of Cuvier. The *Muricidæ* all prey on other mollusks, boring through the shells with their hard-toothed proboscis. Species are found in all parts of the world, the largest in tropical regions. Some, from the length of the beak, are called "woodcock shell." Some have the shell beset with long and regularly arranged spines. The whorls of the shell are marked with ridges or *varices*. The celebrated dye of the ancients, called Tyrian purple, was derived from species of the *Muricidæ*. Another species—*Muricidæ tribulus*—is the "Venus Comb" of the Indian Seas, a very delicate and beautiful shell, with numerous long, thin spines. Fossil *Muricidæ* are numerous, but are seldom found in any formation older than the eocene tertiary.

Murlock. The young pickled dog-fish.

Murray, Alexander, Rear-Admiral U.S.N. Born in Pennsylvania. Appointed midshipman August 22, 1835; served three years in West Indies; 1839 and 1840, Seminole war. Passed midshipman in 1841, and returned to Seminole war; joined the Pacific Squadron in 1843; was made acting lieutenant, and served in the "Shark," "United States," and "Levant," and returned home in 1845. In 1846 joined the Gulf Squadron, and was at the battles of Alvarado, Tabasco, Vera Cruz, Tuspan, and Tampico; was slightly wounded at Alvarado.

Commissioned lieutenant in August, 1847; served on coast survey until 1849, when he joined the razee "Independence," Mediterranean Squadron; returned to United States in 1851. In January, 1852, appointed to command the steamer "Fulton," and sailed, with Vice-President King on board, for the West Indies; after visiting two or three ports, Mr. King's health demanded his return, and the "Fulton" landed him at Mobile, where he died in a few days; the "Fulton" returned to Norfolk in May; served on board the "Pennsylvania" (receiving-ship) until 1853. Appointed to command the surveying steamer "Bibb"; joined the frigate "Cumberland" in 1860 as executive-officer, and after arriving at Vera Cruz was appointed to command the "Pocahontas"; was detached in Norfolk, and returned to the "Cumberland" without orders; was present at the burning of the navy-yard. Appointed to command the steamer "Louisiana," August 3, 1861; had a conflict, and repulsed the rebel steamer "Yorktown" off Newport News, September 20; October 5 had another fight, in Cocklin's Creek, Eastern Shore, resulting in the destruction of a vessel being equipped as a privateer; participated in the battles of Roanoke Island, February 9, of Elizabeth, February 10, of Newbern, N. C., February 14; was appointed senior officer in York and Pamunkey Rivers; co-operation with the army in its movement on Richmond.

May 17, 1862, pushed up the river in advance of the army, and, aided by some volunteers from the army in small transports, forced the enemy to destroy his transports, 17 vessels in all, 2 of them steamers. Battle was not offered, though he sighted the enemy at many points.

Commissioned commander on July 16, 1862; ordered to navy-yard, Portsmouth, N. H.; November, 1862, was ordered by telegram to return to sounds of North Carolina as senior officer; attacked Kingston, N. C., to create a diversion in favor of the army, which was moving on Goldsboro'; February 14, with the gunboats repulsed the attempt of the enemy to recover Newbern; April, 1863, ordered to resume duties at Portsmouth Navy-Yard; September, 1865, appointed to command "Rhode Island"; and October 24, sailed for Havana with tender "Hornet" and crew for "Stonewall," which Commander Murray had been directed to receive from authorities in Havana; November 24, 1865, returned to Washington, bringing "Stonewall"; May 6, 1866, sailed from New York with "Augusta" (side-wheel), "Miantonomah" (double-turret), and "Ashuelot" (double-ender), for Russia.

Promoted to captain, July 25, 1866; in July, 1867, the expedition returned to United States, having, in company with the monitor, visited the Mediterranean and West Indies, after leaving the Baltic; navy-yard, Philadelphia, 1868–69; light-house inspector, 1870–72.

Promoted to commodore, April, 1871; member of Light-House Board until June, 1866.

Promoted to rear-admiral, April 26, 1876, and ordered to command Pacific Fleet; May 1, 1878, retired at his own request after forty years' "faithful service," under act March 3, 1873, the admiral's service in the Pacific being highly commended by the Navy and State Departments in official documents.

Musca. See CONSTELLATION.

Muscat is a seaport of great commercial importance on the Indian Ocean, near the eastern angle of Arabia, in lat. 23° 34′ N., lon. 58° 50′ E. The cove of Muscat, as the harbor is called, is an inlet of the sea about three-quarters of a mile long by one-half of a mile wide, opening to the northwest, and completely sheltered from the prevailing monsoons. The excellence of its port and its convenient position near the entrance of the Persian Gulf make it important as a station for shipping. The docks for building and repairing shipping are situated at Muttra, at the foot of the bay, about 3 miles from Muscat. The imports of Muscat consist chiefly of almonds, aloes, sulphur, nitre, coffee, etc., from Persia and Africa, most of which are re-exported. Large quantities of dates, wheat, horses, and fish are among the exports. Population of Muscat, Muttra, and intervening villages is about 50,000.

Musgum, or Misgurn. A kind of fish resembling the eel in size and form.

Mushroom-anchor. An anchor with a head like a mushroom, and having no stock; it is used for permanent moorings. See ANCHOR.

Musketoon. A short kind of blunderbuss with a large bore, to carry several musket- or pistol-bullets. It was much used on boat-service. They were mounted on several crutches, and termed top-pieces or quarter-pieces in barges and pinnaces, where timbers were especially fitted for them.

Muster. When all hands are called to muster, the men assemble on the port or lee side of the quarter-deck, and the officers on the opposite side. If, after the special purpose for which the crew has been assembled has been accomplished, it be desired to call the roll, the petty officers form a line in the opposite gangway, where they are mustered by the paymaster's clerk. Having finished with the muster of the petty officers, the remainder of the crew is mustered, beginning with the seamen. As each man's name is called, he takes off his cap, crosses the deck, and walks forward. At muster, the officer of the deck accounts for those on duty, the master-at-arms for those in confinement, and the apothecary for the sick. Every person unaccounted for is so entered in the log-book. *To muster the watch*, to call the names of the watch, in order to make sure that all are on deck; this duty is done by the junior officer of the watch just after 8 bells, and as often thereafter as the officer of the deck directs. *To pass muster*, to pass inspection; to answer the purpose intended.

Mute. A prisoner arraigned before a court-martial, when called upon to plead, may, through obstinacy, remain silent. This is technically termed *standing mute*. In such a case the court proceeds with the trial as though a plea of not guilty had been made. The same course is pursued in cases where the prisoner, instead of pleading properly, answers foreign to the purpose with the deliberate design to obstruct the proceedings.

A prisoner may stand mute by the visitation of God, in which case, if it be only an inability to articulate, the court proceeds as above.

By the common law of England, obstinately standing mute, upon arraignment for certain species of offenses, was deemed equivalent to conviction, upon which judgment followed.

Mutiny. An insurrection against constituted authority, particularly military or naval authority. An open and violent resistance to the authority of officers. It may be the act of an individual or the concerted action of several. The Articles for the government of the navy provide that any person in the navy who makes, or attempts to make, or unites with, any mutiny or mutinous assembly, or who being witness to or present at any mutiny does not do his utmost to suppress it; or who, knowing of any intended mutiny or mutinous assembly, does not immediately communicate his knowledge to his superior or commanding officer, shall suffer death or such other punishment as a court-martial may adjudge.

MUTINY ACT. An English statute for the government of military persons, and vesting in the crown power to frame articles of war.

The occasion that gave rise to the Mutiny Act was a rebellion on the part of some English and Scotch troops in the first year of William and Mary's reign, upon their being ordered to Holland to replace some of the Dutch troops which King William had brought over with him, and intended to keep in England. The Scotch were disgusted because Lord Dumbarton had been supplanted in the command of one of their regiments by Marshal Schomberg, and the disaffection of the English was occasioned by emissaries of James, who intimated to them that they were being ordered out of the country because of their fidelity to their late sovereign. King William immediately communicated this event to both houses of Parliament, who readily agreed to give their sanction to punish the insurgents; and on the 3d of April, 1689, passed an act for punishing mutiny and desertion, and establishing a code for the general government of the army, which was to continue in force till November following, and no longer. It was, however, renewed again the next January, and has, with the interruption of about three years only, in the peaceable part of King William's reign, viz., from the 10th of April, 1698, to the 20th of February, 1701, been annually renewed since, with occasional alterations and amendments.

The Mutiny Act was the first regularly enacted statute ever passed in England for the regulation of the military state, and may therefore with propriety be considered as the original of *military* in contradistinction to *martial* law. (See MARTIAL LAW.) It formed the model of our own Articles of War, though, unlike it, our Articles are not limited to one year's duration, necessitating, as in the case of the Mutiny Act, their annual re-enactment.

Mutton-snapper. A large fish of the *Mesoprion* genus, frequenting tropical seas, and prized in the Jamaica markets.

Muzzle. The forward extremity of a piece of ordnance.

MUZZLE-BAG. A painted canvas-bag placed over the muzzle of broadside-guns at sea to keep the water out.

MUZZLE-LASHING. The rope which confines the muzzle of a gun when housed.

Muzzy. Half-drunk.

Myopara. An ancient corsair's vessel.

Myrmidon (from *mur-medon*, a sea-captain). The Myrmidons were a people of Thessaly, said to have first constructed ships.

Mystico. A Greek piratical boat. See MISTICO.

Myth. Obelisk, tower, land, or anything for directing the course by sight.

N.

N. Abbreviation for *not* in the U. S. General Service Signal Code.

Naca, or **Nacelle.** A French row-boat used as early as the twelfth century.

Nacta. A small transport of early times.

Nadir. The inferior pole of the celestial horizon. It is the point of the heavens vertically under a spectator's feet,—the vertex of the invisible hemisphere. The nadir is diametrically opposite to the *zenith*.

Nagasaki, on the southwest side of the island Kioo-Sioo, Japan, in lat. 32° 44′ 8″ N., lon. 129° 51′ 33″ E., is one of the import seaports of the empire. The harbor is about 7 miles long by 1 mile wide, with good anchorage, securely sheltered, in from 5 to 7 fathoms of water. It has a large European and Chinese trade, and is also the supply station for U. S. men-of-war, as the naval store-house for the Asiatic Station is located here. Pop. about 70,000.

Naides. A natural order of endogenous plants found in the ocean, and also in lakes and streams.

Nail. *To nail a gun*, to spike it.

Nake. The old word to unsheath swords, or make them naked.

Naked. State of a ship's bottom without sheathing.

Nakhadah, or **Nacodah.** An Arab sea-captain.

Name-board. The arch-board, or part whereon the ship's name and port are painted.

Nancy Dawson. A popular air by which seamen were summoned to grog.

Nankin. A species of cloth used for making working-clothes, and for facings for cuffs and collars.

Nantes, on the river Loire, at the confluence of the Erdre and Sèvre-Nantaise, is the capital of the department of Loire-Inférieure, and one of the principal cities of France. Merchant vessels are built here, and the town has numerous manufactories of cottons, muslins, cordage, etc.; also an extensive maritime commerce, although the harbor receives only small vessels, large vessels being compelled to unload at Paimbœuf. It possesses among its many institutions a tribunal of commerce, a hydrographical school, and a magazine of munitions for the marine. Pop. 123,000.

Naphtha. A very inflammable, fiercely-burning fluid, which oozes from the ground or rock in many different localities, and may be obtained by the distillation of coal, wood, and other substances.

Naples, the most populous city of Italy, is situated on the Bay of Naples, at the foot of Mount Vesuvius, in lat. 40° 51′ 8″ N., lon. 14° 15′ 5″ E. The city is surrounded by walls, and defended by three castles, St. Elmo, Nuovo, and Del Ovo. Immediately adjoining is a large arsenal and cannon-foundry. The city contains a royal marine hospital, ship-building yards, and a military school. The most important manufactories are those of macaroni, vermicelli, silk stuffs, fire-arms, chemical products, etc. Although the Bay of Naples is very extensive, the harbor proper is of small dimensions, and the water near the town is only deep enough to float shallow vessels. It is a regular stopping-place for the Mediterranean steamers. Pop. 450,000.

Narke. A ray of very wonderful electric powers.

Narrowing of the Floor-sweep. For this peculiar curve, see RISING HALF-BREADTH.

Narrows. The most confined part of a channel between two lands; any contracted part of a navigable river.

Narwhal. The *Monodon monoceros*, an animal of the cetacean order, found in the Arctic seas, and distinguished by the single long pointed tusk projecting straight forward from its upper jaw, whence it is also termed *sea-unicorn*.

Nath. The name of the bright star *β Tauri*.

Naturalization. The process by which an alien is made a citizen. By Art. I., Sec. 8, of the Constitution of the United States, Congress is vested with power "to establish an uniform rule of naturalization," and although formerly it was held by some that the State governments possessed a concurrent authority with the United States upon the subject of naturalization, it has now long been settled that the power vested by the Constitution in Congress respecting naturalization is exclusive. The power to admit to citizenship aliens desiring naturalization has been committed by Congress to the various courts of record, both Federal and State having common law jurisdiction. The naturalized citizen of the United States enjoys all the privileges and immunities of the native-born, save only eligibility to the office of President.

The process of naturalization in the United States consists in the declaration, on oath or affirmation by the alien, before a court of competent jurisdiction, or the clerk of such court, of his intention, *bona fide*, to become a citizen of the United States, and his renunciation of all

allegiance to any foreign prince or power, and particularly of his allegiance to the sovereign or state of which he is at the time a subject; which declaration and renunciation must be made at least two years before his admission to citizenship. At the time of his application for admission he must further declare, in the same manner and form, that he will support the Constitution of the United States, and make a further absolute and entire renunciation of all allegiance and fidelity to every foreign prince, potentate, state, or sovereignty whereof he was before a citizen or subject; and of these proceedings the clerk of the court makes record. The court, before admitting the alien, must be satisfied by evidence, other than that of the applicant himself, that he has resided in the United States five years at least, and in the State or Territory wherein the court is held, at least one year; and it must further appear that during that time he has behaved as a man of good moral character, attached to the principles of the Constitution of the United States, and well disposed to the good order and happiness of the same. If the alien shall have borne any hereditary title, or been of any of the orders of nobility, in the kingdom or state from which he came, he must make renunciation of the same. The previous declaration of intention is dispensed with in the case of an alien who, being a minor, shall have resided in the United States three years next preceding his coming of age, and who shall have continued to reside therein to the time of his applying for admission to citizenship, but, including the three years of his minority, he must have had a continuous residence of five years, and at the time of his admission he must declare on oath or affirmation that for the three years next preceding it has been his *bona fide* intention to become a citizen of the United States. If an alien who has declared his intention dies before he is actually naturalized, his widow and children are considered citizens, and shall be entitled to all rights and privileges as such upon taking the oaths prescribed by law. The children of persons duly naturalized, who were minors at the time of their parents' admission to citizenship, are, if dwelling in the United States, considered as citizens; and the children of persons who now are, or have been, citizens of the United States, are citizens; but the rights of citizenship cannot descend to persons whose fathers have never resided in the United States. The naturalization of a father *ipso facto* makes his son then residing in the United States, and under 21 years of age, a citizen. No alien who shall be a native, citizen, denizen, or subject of any country, state, or sovereign with whom the United States shall be at war at the time of his application can be then admitted to be a citizen of the United States. A seaman, being a foreigner, having declared his intention of becoming a citizen of the United States in any competent court, and having served three years on board a merchant vessel of the United States subsequent to the date of such declaration, may be admitted to citizenship on making application to any competent court, and producing his certificate of discharge and good conduct, together with the certificate of his declaration of intention. This provision does not extend to seamen in the naval service. Admission to citizenship does not necessarily carry with it the right to vote. The elective franchise is regulated by the several States, each for itself, the only restriction imposed by the Federal Constitution being that contained in Art. XV., Sec. 1, that "the right of citizens of the United States to vote shall not be denied or abridged by the United States, or by any State, on account of race, color, or previous condition of servitude."

Natural Projections. Perspective delineations of a surface on a given plane. They are formed by drawing from the eye straight lines, indicating the visual rays, through every point of the surface to meet the plane. The original and the representation produce the same effect on the organ of vision. Examples,—the orthographic, stereographic, and central projections of the sphere.

Naumachia. The appellation given by the Romans to a spectacular diversion consisting in a naval engagement which usually took place in theatres (called also naumachiæ) made especially for the purpose. These exhibitions were originally instituted for the purposes of naval discipline, but in process of time only malefactors or captives whose lives had been forfeited participated in them. They appear to have been conducted on a scale of such magnificence as almost to exceed belief. Within the places set apart for them whole fleets went through their evolutions without inconvenience or confusion, and all the appliances of human ingenuity were put in play to give an air of reality to the representation. Suetonius narrates that in an exhibition of this sort given by Nero, sea-monsters were seen swimming about in the artificial lake; and in the sea-fight on the lake Fucinus, given by Claudius, there are said to have been no fewer than 19,000 combatants. Julius Cæsar appears first to have given a naumachia on an extensive scale; his example was followed by many of his successors on the imperial throne; and at last they were frequently exhibited at the expense of private individuals as a means of increasing their popularity.

Nauropometer. An instrument for measuring the amount of a ship's heel or inclination at sea.

Nauscopy. The tact of discovering ships or land at considerable distances.

Nautical (Lat. *nauta*, Gr. *nautēs*, a seaman; Lat. *navis*, Gr. *naus*, a ship). Belonging to ships; pertaining to a seaman's business. The term is applied in a general, comprehensive sense; thus, *nautical science* includes the two branches of *navigation* and *seamanship*.

Nautical Almanac. See Almanac, Nautical.

Nautical Astronomy. That part of astronomy made use of in navigation.

Nautical Day. See Day, Nautical.

Nautical Mile. See Mile, Nautical.

Nautical School-Ships. See School-Ships, Nautical.

Nautical Stars. The bright stars used by navigators in observations for the determination of latitude and longitude.

Nautical Tables. Tables especially computed for the solution of problems in navigation.

Nauticum Fœnus. Marine usury; bottomry.

Nautilus. The pearly nautilus, *N. pompilius*, is a marine animal, belonging to the same class (*Cephalopoda*) as the cuttle-fish, but protected by a beautiful, chambered, discoid shell. The paper-

nautilus (*Argonauta argo*) belongs to a different family of the same class, and has a simple, delicate, boat-like shell.

Naval. Pertaining to ships. Of, or belonging to, the navy.

Naval Apprentice. See NAVAL TRAINING SYSTEM.

Naval Architecture. See SHIP BUILDING.

Naval Brigade. In a preceding article on "landing-parties," the equipment and organization of men from single ships, for operations on shore, has been treated. It has been customary in the service to give the name of "naval brigade" to even a single ship's company, although by rights it refers to a larger organization. We shall treat it in its true meaning, although what applies to it will be found applicable on a reduced scale to smaller parties.

The ships of a squadron being assembled for offensive operations, and each ship having a battalion organization, the organization of the brigade becomes a very simple matter. In modern armies the tactical unit is the company, having a war strength sometimes as high as 250 men. As the naval company is necessarily small, on account of the limited number of officers and the comparative want of experience of the men, the battalion of four such companies would seem to furnish a good basis. The larger ships would each furnish a full battalion, any companies remaining over being joined with those of the smaller ships to complete their quota,—the marines forming a battalion under their own officers. Arrangements should also be made to form a brigade supply-corps and brigade hospital. The artillery should be formed into batteries of two or three platoons each, care being taken to have the guns in each battery of the same class. An artillery supply-train must also be organized.

The naval brigade is commanded by a commodore or captain, assisted by a staff consisting of an adjutant-general, an ordnance-officer, a signal-officer, a paymaster, a surgeon, and several aids. Attached to the headquarters are a squad of orderlies and signalmen, one of whom carries the headquarters flag, which should always mark the point where the commander-in-chief is to be found, but should not be so conspicuous as to draw the enemy's fire.

The battalions should each have two field-officers, an adjutant, and a paymaster; the batteries one field-officer, an adjutant, paymaster, and gunner.

Landing.—All the details of organization having been completed, such as the assignment of companies and guns, the appointment of commanders of battalions and batteries, the assignment of battalions and batteries to positions in line, the amount of ammunition and stores to be carried by the men, the amount for the brigade supply and for the base of operations, the detail of ships to cover the landing, or in the absence of such ships, the fitting out and arming of such small vessels as may be available. In the absence of either, when the landing is to be in force, beyond the range of the ship's guns, gun-rafts should be built, on which some of the lighter ship's guns or heavier howitzers should be mounted behind hammock breastworks. At any rate, some of the large boats should be fitted to carry the heavy howitzers and to act as gunboats. The boats should all be distinctly numbered on each bow and on the stern. Each boat should be provided with a good anchor and long cable. The force is divided into fighting line, supporting line, and reserve line. Writers on this subject generally advocate the use of the marines for the skirmish or fighting line, the reason being that the marines are supposed to be better drilled in skirmishing. This may be the fact, but it should not be so, as blue-jackets can be just as well instructed when there is a desire to do so. The marines are undoubtedly the best-disciplined infantry, and should, therefore, form the reserve. If it is decided to assign the marines to the fighting line, they should be put in boats by themselves, pulled by men from the reserve battalions, unless the marines have been instructed in rowing, as they certainly should be. All the large boats should have four, and the smaller ones two, boat-keepers, armed as riflemen. The steam-launches and permanent covering-boats should have regular crews. An officer, with assistants, should be assigned to the command of the boats and boat-keepers.

The men to form the expedition having been thoroughly inspected on board their ships, signal should be made for them to embark in their boats. The lines should then be formed in order that all may learn their stations. When all is ready to start, the boats should be taken in tow by the steam-launches or small vessels. The tows should proceed in the order most convenient for reforming the lines. The artillery-boats should be on the flanks, and in rear of the centre of the line. A convenient method of towing artillery-boats near the enemy is to lash one on each side of the towing boat.

The circumstances under which a landing has to be made are so variable that no general rule can be laid down. We will discuss the two which seem the best to cover the subject: 1st, landing on the water front of a town; and, 2d, landing on a beach,—the enemy opposing the landing in both cases.

On approaching the town the covering-vessels will take up position so that they can shell the landing, and at the same time cover the land-approaches to prevent the arrival of reinforcements. The artillery-boats will then advance and take up positions to clear the landing and command the principal streets and buildings likely to shelter the enemy's riflemen. The sea-force having been well shelled, the first line of infantry will pull in to the best landing-places; once ashore, the first line of buildings will be occupied and manned on the land side. The second line will now pull in and land; forming under cover of the buildings, they will prepare to move up as many of the streets normal to the shore as possible. The light guns and machine-guns will now be landed. Some will be placed in position on the first line of buildings, others will join the different street columns. The reserve will now be landed and massed so as to move by the principal thoroughfares. The advance will then be sounded. The first line will move through the buildings to the front, dislodging all of the enemy's men. The second line will move in support of the first through the streets, extending wherever it is found possible, and clearing all the streets parallel to the shore. Care must be taken to keep up a good line of communication. The reserves will support the

second line, and will be prepared to reinforce any point of the fighting line which may be hard pressed. In moving up streets it will be found best to have the men remain close to the houses, taking advantage of the shelter offered by door-steps, doorways, etc. The men on the right side of the street must dislodge any of the enemy who may appear in the windows or on the roofs on the left side, and *vice versa*. In case the enemy exposes masses of men, the machine-guns must be brought up. If barricades are met, counter-barricades must be erected as soon as possible and the howitzers brought up.

On approaching a beach, the covering-vessels must take position so as to enfilade any work which the enemy has erected, and to command the approaches. The artillery-boats must clear the beach and sand-hills of bushes backing them. The first line must then land, contending as skirmishers and taking possession of the first line of sand-hills. The second line and light guns must then land and occupy the positions taken by the first line, the first line advancing to new positions if possible. The reserve will then land and the enemy will be attacked in force. The first line will be in extended skirmish order, the second in line in single rank, the reserve in column of fours or double column of fours. The artillery will take up and maintain the most commanding positions which can be found, and, having gotten a good position, will retain it until the range becomes too great. Great care will be taken to have all persons who are not actually engaged kept as much under cover as possible; this not only protects the men, but deceives the enemy. The reserve should be kept constantly intrenching itself, and the advance should do the same whenever it is possible and does not retard the movement.

In both cases, as soon as the main body has moved to the front, the boats should be placed so as to render an embarkation as speedy as possible. Off a beach it will be found best to anchor and have a hauling-line to the shore from the stern, the cable being long enough to run into the beach. The boat-guard will then throw up rifle-pits along the first line of sandhills or barricade the first line of houses and street openings as the case may be.

In case of a retreat, the first troops at the landing will relieve the boat-guards, who will proceed to the boats.

If the objective-point of the landing is inland and necessitates a regular campaign, the greatest care must be taken to observe all the precautions and provide all the essentials which would be observed and provided by regular land-troops.

Every means should be taken to collect wheeled transportation, and draft animals, not only for the wagons, but for the guns. If possible, the field-officers and a number of marines, or other men who can ride, should be mounted as orderlies and videttes.

The column should never move without a regular advance- and rear-guard and flankers. Scouting-parties should be sent out in all directions. The artillery should be massed in the centre with the baggage, a few of the lighter guns being detailed to the out-guards.

If it is found necessary to bivouac, the ground should be selected in regard to its defensibility, its healthiness, and its nearness to water. Strong lines of sentinels and outposts should be established to guard against surprise.

When the main body is in a valley or gorge, the heights should always be occupied.

For those who wish to prepare themselves more thoroughly for naval brigade duties we would recommend a perusal of portions of the "Ordnance Instructions," 1880; Cook's "Gunnery," 2d edition; Bedford's "Sailors' Pocket-Book," 3d edition; Worsley's "Soldiers' Pocket-Book," etc.—*Theo. B. M. Mason, Lieutenant U.S.N.*

Naval Chaplain. The origin of the title chaplain is said to be this. St. Martin divided his cloak with a naked beggar whom he found perishing with cold at the gate of Amiens. The cloak, miraculously preserved, was carried by the French monarchs as a sacred banner. The oratory in which this cloak or cape (French, *chape*) was preserved acquired the name "*chapelle*," and the person intrusted with its care was termed "*chapelain*," and thus, according to Collin de Planey, came our words "chapel" and "chaplain." The office of chaplain is one of the most ancient in the British navy, being almost coeval with its establishment. In a report of the commission appointed to inquire into the state of the navy in 1618, it is shown among other abuses that "in the narrow seas there is an allowance demanded for a preacher and his man, though no such devotion be used on board." July 26, 1620, George, Duke of Buckingham, wrote to the University of Cambridge in behalf of the appointment of Daniel Ambrose to one of the king's ships, and about the same date there was a grant of groats from the seamen's wages to chaplains. In 1678, Henry Teonge was chaplain of the "Bristol," 48, who, though fond of "piggs," "ghoose," and that "strange liquor, punch," which he first tasted on board, was evidently an honest, pious, and orthodox Parson Adams of the sea. His Diary, when chaplain on board the "Assistance," "Bristol," and "Royal Oak," 1675 to 1679, first published in 1825, is a most amusing book, as well as portrait of a chaplain in the royal navy 200 years ago. He says in the beginning: "May 20, 1675.—This day I began my voyage from my house" "with small accoutrements, saveing what I carried under me in an old sack." "My steed like that of Hudibras." (23d) "My stock of moneys was also proportionable to the rest, being little more than what brought me to London in an old coate, and britches of the same, an old payre of hose and shoes, and a leathern dublett of 9 yeares olde and upward. Indeed, I had (by reason of the suddennes of my jurny) nothing but what I was ashamed of, save only

> 'An old fox broade-sword, and a good black gowne;
> And thus Old Henry cam to London towne.'"

Chaplains have been in the U. S. navy almost from its commencement. We find Elie Vallette a chaplain February 26, 1800, discharged June 8, 1801, under the Peace Establishment Act. Rear-Admiral Elie A. F. Vallette, or La Vallette, as subsequently called, was appointed a lieutenant December 19, 1814, and was probably his son.

At the present time (1880) there are 24 chaplains on the active list in the U. S. navy, 4 holding the relative rank of captain, 7 the rank of commander, 13 the rank of lieutenant. On the

retired list, 6 with the rank of captain, and 1 with that of commander.

Naval Constructors. The first naval constructor of the U. S. navy who was appointed under the War Department before the Navy Department was established was Joshua Humphreys, who died or retired from office October 26, 1801. His son, Samuel Humphreys, succeeded him, and died in office August 16, 1846. There are now (1880) in the service on the active list:

One chief constructor with the relative rank of commodore.

Two naval constructors with the relative rank of captain.

Three naval constructors with the relative rank of commander.

Five naval constructors with the relative rank of lieutenant.

One assistant naval constructor with the relative rank of lieutenant.

Four assistant naval constructors with the relative rank of master.

And on the retired list:

One chief naval constructor with the relative rank of commodore.

Three naval constructors with the relative rank of captain.

Naval Crown. One of the nine crowns in heraldry, consisting of a rim of gold or silver, round which are placed alternately prows of galleys and square sails. It is said to have originated with the Roman emperor Claudius, who, after the conquest of Britain, instituted it as a reward for maritime services. He who first boarded an enemy's ship, and was the occasion of its being captured, was entitled to a naval crown.

Naval Hoods. Those hoods wrought above and below the hawse-holes, outside a ship, where there are no cheeks to support a bolster.

Naval Hospital, Brooklyn. The United States Naval Hospital Establishment for the New York Station is in Brooklyn, half a mile to the eastward of, but separated from, the navy-yard. It occupies the hill portion (56 feet above tidewater) of the Schenck farm, purchased by the government in 1820. The grounds, inclosed by a high and substantial brick wall, comprise 20 acres, laid out in lawns, walks, flower- and kitchen-gardens, with an abundance of well-grown shade- and fruit-trees.

At first the family mansion and farm buildings were metamorphosed and extended so as to answer the hospital requirements of our adolescent navy, and it was not until 1828 that the main building of the present hospital became ready for occupancy. This edifice, 200 by 60 feet, is two stories, with full basement and attic. There were added to it in 1840 two wings, each 73 by 49 feet, of same height as main building; and at the same time was built a "pest-house" of uniform height and style,—this latter structure was subsequently transformed into the naval laboratory, and an ample building for pestilential diseases located more remotely. By another change the dead-house was converted into a tasteful chapel. These buildings are of white marble from the quarries near Sing Sing.

The hospital is appointed to accommodate 125 patients, though during the Rebellion the lists ran up as high as 450, but many of these were billeted in a wooden annex, which was torn down after hostilities ceased. The general conveniences and appurtenances of the hospital, and the system of heating and ventilation, are as complete as it is possible to arrange. The same machinery that drives heated air throughout the buildings during winter fans the wards and rooms and corridors with a cooling breeze in summer.

Connected with the grounds is a naval cemetery, where many officers and members of their families have been buried, as well as sailors and marines. Up to 1880 there had been registered 1134 interments.

The residence of the medical officer in charge is a comfortable suburban villa, built half a century ago, and sequestered by an intersecting wall. The more modern and conspicuous dwelling near the hospital was erected during the war for the director of the laboratory. Besides these are the usual and necessary lodges and houses for employés, conservatory, engine-house, sheds, barns, stables, etc.

Medical Inspector Delavan Bloodgood is in charge of the hospital, and Medical Director Samuel F. Coues of the laboratory.—*Delavan Bloodgood, Medical Inspector U.S.N.*

Naval Hospital, Chelsea, Mass., is beautifully situated on the left bank of the Mystic River. It furnishes accommodations for all the sick or wounded officers, seamen, and marines of the navy at Boston, Portsmouth, N. H., and New London, Conn., and for all invalids from our naval vessels on foreign stations who may come into the port of Boston. The land occupied by the hospital was purchased from Dr. Aaron Dexter, of Boston, on the 22d of September, 1823, by a commission composed of the Secretary of the Navy, the Secretary of the Treasury, and the Secretary of War. There were originally 115 acres in the tract, for which the government paid $18,000; there now remains about 75 acres, the remainder having been transferred to the Ordnance Department of the navy, and to the Marine Hospital Service. The hospital building is 149 feet by 71 feet, and was completed January 7, 1836; a wing was added in 1865. It is substantially built of granite, and is capable of accommodating 100 sick men comfortably. It has three floors beside the cellar and the attic, and has a pyramidal roof. On the first or ground floor are the entrance-hall, the dispensary, kitchen, and offices. The second story contains the wards that are usually occupied by the sick. The hospital fronts the river, and is on the southern exposure of the hill. There is a good supply of sunlight, the sun shining into all the windows at some period of the day. There are westerly breezes from the river, and the hospital is perfectly protected by the hill from the northeast storms, which prevail for six months of the year, and are very penetrating. The ventilation of the hospital is by flues in the partition-walls, which are continued four feet above the roof. The water is supplied from the Mystic reservoir, and is abundant in quantity and very good in quality. The particular merit of this hospital is that it is the only naval hospital on the entire Atlantic coast that is absolutely free from malarial poison. Patients suffering from this disease have been sent here from all the naval hospitals south of Boston, and often recover. Most of the cruising of our naval vessels is within the tropics, and

nearly all cases of sickness are more or less complicated by malarial poison, so that this hospital is better situated for treating the sick of the navy than any other that we have.—*Wm. T. Hord, Medical Director U.S.N.*

Naval Hospital, Mare Island, Cal. *Topography.*—This hospital comprises an area of about 27 acres, situated near the southeastern extremity of Mare Island, and about 1 mile from the navy-yard, with which it is connected by a smooth roadway and a planked walk. It lies upon the eastern slope of a series of curving, somewhat elevated hills, which incline gently to the straits, an arm of San Pablo Bay, separating the island from the mainland.

The soil is a thin, dark loam, with underlying clay and a bedrock of granite. Midway upon the hill-side, the ground has been leveled for the site of the hospital building. Above this is a young park of eucalyptus-trees, while the remainder of the grounds is covered with a variety of trees, chiefly eucalyptus and acacia, and ornamental shrubbery, all laid out into roadways, walks, and garden-plots, where flowers of the temperate and subtropical zones are grown in profusion. Here and there a fountain throws a jet or a spray from the centre of a fish-pond or a rockery.

The view from the hospital affords a pleasing variety. To the left is the navy-yard, with the town of Vallejo opposite; in the middle distance lie the straits, with a cultivated, rolling plain beyond them, dotted with residences, while a chain of mountains fills in the background and the right, as we look eastward from the hospital front.

Buildings.—The hospital building was erected in 1869–70, under the supervision of Medical Director (then Surgeon) J. M. Browne, U.S.N., and was opened for the reception of patients in February, 1871.

Its length is 256½ feet, height 3½ stories, including the basement, and the shape a rectangular parallelogram, the regularity of the outline being broken by jutting portions.

The structure is brick, made from clay obtained near the site of the hospital. It is strengthened by perpendicular iron rods anchored in the walls and crossing five lines of similar rods, which encircle the building in a horizontal direction.

The building consists of a central portion and two wings. The latter are provided with verandas for the first and second stories, which extend their entire length, and are easily accessible from the wards. In the central portion is the main entrance, protected by a portico, at each end of which a jutting tower rises several feet above the Mansard roof, and supports an iron tank from which water is distributed to various parts of the house.

In the basement are the general mess-room, kitchen, smoking-room, store-rooms, chambers, and mess-room for all attendants, bakery, laundry, with stationary tubs and drying coils, and the fire-room, with donkey-engine for filling the tower-tanks and flushing the sewers.

On the first floor are the reception-room, general and private offices, quarters and mess-room for the attending medical officers, and the dispensary on either side of a central corridor, near the extremities of which are a nurse's room and a diet-kitchen. At each end of this corridor is a ward for patients of the following dimensions, viz.: length 68 feet 5 inches, width 24 feet, height 14 feet 9 inches. It is lighted by 13 windows, 5 on each side and 3 at the farther end, each 9 feet 2 inches by 2 feet 11 inches, heated by an open grate at either end of the ward, and ventilated satisfactorily by the windows and 8 ventilating flues. It is provided with water-closets, stationary marble wash-basins, and a bath-room with hot and cold water. The capacity is 20 beds, and when all are occupied each patient has about 82 square feet of floor-space.

On the second floor are the two remaining wards, similar in all respects to those below. They also are connected by a corridor, opening upon which are apartments for invalid officers and the executive surgeon. A nurse's room and a diet-kitchen are near each ward.

On the attic floor are additional chambers for attendants, the *post-mortem* room, a prison for refractory patients, and the bag-room for the patients' hammocks.

There are two water-closets and a bath-room on each floor besides those in the wards. A linen shute near each ward and an elevator extend from the attic to the basement.

Electric call-bells are attached to the officers' rooms, and a telephone connects the hospital with the navy-yard.

The building is lighted at night by gas manufactured on the premises, heated throughout by open grates, and provided with a good sewerage, the conformation of the grounds rendering efficient drainage easy.

The water used in the hospital is rain-water collected by drainage from the neighboring hillsides into a large reservoir, whence it is delivered through iron pipes into two subterranean cisterns near the building having each a capacity of 90,000 gallons.

The ward for patients affected with contagious diseases is situated beyond the hills, and about one-half mile west of the hospital. It is an ordinary frame building, and merits no particular description.

The administration of the hospital consists of a medical director in charge, an executive and two attending surgeons, an apothecary, purveyor, two nurses, and general subordinates.

Climatology.—In the absence of complete meteorological data it must suffice to say that the mean annual temperature of Mare Island is about 60°, the extremes 35° and 86° F. The latter are the minimum and maximum *recorded* during the 10 years from 1869 to 1879. The rain-fall varies from 16 to 38 inches, approximately, and occurs almost wholly between November and May in a succession of April showers. Snow rarely falls, and never lies upon the ground longer than a few minutes. Ice, and even heavy frost, is exceptional, so that flowers may be seen blooming in the open air throughout the year, and but little fire is commonly needed even in midwinter.

The prevailing winds are westerly, and during the summer months are steady, fresh, and sometimes chill. The nights are always cool.

As a sanitarium, this hospital is probably unsurpassed by any similar institution in the country. The mildness and equability of the climate, and the picturesque surroundings, invite the invalid to an out-of-door life with its attend-

ant sunshine, fresh air, and gentle exercise, and while conveniently near Vallejo and San Francisco for the purchase of supplies, the comparative isolation of the hospital affords the quiet and repose of country life. It is the sanitary resort of patients from all the United States men-of-war cruising on the Pacific, and although they come from the coast of Mexico, Central and South America, Japan, and China, yet all find the climate grateful and conducive to restoration of health.—*J. M. Browne, Medical Director U.S.N.*

Naval Institute. The United States Naval Institute was organized at Annapolis, in the fall of 1873. The object of the institute is to provide a medium for the circulation of knowledge on subjects of interest to the profession, and to bring the subjects under discussion.

As the officers of the navy are scattered all over the globe, it is impossible to get any very great number of them together in one locality; for this reason the society is divided into branches, each branch holding its own meetings and electing its own local officers. The headquarters are at Annapolis.

The papers read in the branches, and the discussions which arise from them, are forwarded to headquarters, where, with those from that place, they are published for general circulation among the members. All officers holding positions under the Navy Department are eligible to membership. Provision is also made to admit, as associate and honorary members, such persons out of the profession as may desire to become members, or whom it may be thought desirable to associate with the undertaking.

Any person eligible to membership has only to send in his name to the secretary of the institute, who is stationed at the Naval Academy, Annapolis, in order to become a member.

The published proceedings form a very interesting and instructive collection of service literature. As we have stated, they are sent to all members from the date of admission, and may be purchased by any person at a slight advance on the cost price.

The institute has met with great success in the service, and the membership is becoming larger every year. There is hardly a quarter of the globe where, during one evening in each month, some of the members may not be found assembled for discussion.

Each year the institute offers a gold medal and a life-membership as a prize for the best essay on some subject selected and published during the preceding year.

The general officers of the institute are a president, a secretary, a corresponding secretary, and a treasurer. Each branch has a vice-president and a corresponding secretary, who acts as local secretary and treasurer.

The dues are very small, $3 for a member, and $1 for an associate, and are payable annually on the first day of January. The admission fee is only nominal. As yet the government has done but very little to foster this undertaking, but it is hoped that before long it may be recognized as one of the institutions of the Navy Department, as is the case with similar societies under foreign governments.—*Theo. B. M. Mason, Lieutenant U.S.N.*

Naval Lyceum. The United States Naval Lyceum was organized at the New York Navy-Yard, November 28, 1833, by the officers of the navy and marine corps stationed at the yard or living in its vicinity. Master-Commandant M. C. Perry presided at the first meeting, and Commodore Chas. G. Ridgely, then commandant of the yard, was the first president. In May, 1835, the lyceum was incorporated by the Legislature of New York, and authorized to hold property valued at $25,000.

The constitution of the society in its preamble declares that it was formed "in order to promote the diffusion of useful knowledge, to foster a spirit of harmony and a community of interests in the service, and to cement the links which unite us as professional brethren." To carry out the objects mentioned a library and reading-room were formed, a museum was established, and papers on naval ordnance, construction, and equipment, etc., were read and discussed, the lyceum being thus the forerunner by forty years of the United States Naval Institute.

During the years 1836 and 1837 a bi-monthly called *The Naval Magazine* was published by the lyceum, with Chaplain C. S. Stewart as editor; it contained articles on professional subjects, narratives of cruises, and general naval intelligence. J. Fenimore Cooper, Commander A. S. Mackenzie, Wm. C. Redfield, Esq., Chaplain Walter C. Colton, and Dr. Usher Parsons were among the contributors to what it is believed was the only purely naval periodical ever issued in the United States. The lyceum was an earnest advocate of the establishment of a naval school and of the increase of the steam navy, and in addition to its magazine published, during its earlier years, various pamphlets on professional subjects. In those days, having a permanent librarian, the lyceum took charge of letters directed to its care and forwarded them to the various foreign stations. The society flourished with a very large membership for over 25 years; during the war of the Rebellion, however, it dwindled in size, and its organization was suspended for some time; it was reorganized in 1871, and now has over a hundred members.

The museum, library, and reading-room occupy the upper floor of the building in the navy-yard, which derives its name from the society, but which is also used for the offices of the commandant, captain, and paymaster of the yard, and their assistants.

The museum grew very rapidly at first, and received many donations from citizens as well as more numerous contributions from officers; it contains a fair collection of coins, minerals, models of vessels, and general curiosities, a fine lot of autographs, and a valuable set of portraits in oil of the earlier Presidents of the United States and of distinguished naval officers, including Bainbridge, Chauncey, Decatur, Hull, Nicholson, Shaw, and Rogers. It is one of the chief objects of interest in the yard, and is daily visited by numerous parties from all sections of the United States, and even from other countries; in 1879 the number of visitors was over 10,000.

The library, like the museum, received many valuable contributions during the earlier years of the society from citizens, as much as $500 being given at one time by some marine insurance companies for the purchase of books; of late years many books have been donated by the various bureaus of the Navy and War Depart-

ments, the naval observatory and the coast survey. It now has 5000 volumes, many of them of great value, and not easily replaced; this is particularly the case with the volumes pertaining to military and naval history, biography, and science; there is also a valuable collection relating to voyages and travels. Nearly all the professional journals of this country and some of the best European ones are taken, as well as several of the literary periodicals of the day.

The officers of the society consist of a president, vice-president, secretary, treasurer, librarian, auditor, and library committee. The commandant of the yard is *ex officio* the president. The entrance fee is $3, and the annual dues $1; the regular meetings occur monthly, on officers' pay-day, at 11 A.M. All cadet midshipmen and cadet engineers are invited to avail themselves of the benefits of the institution by the tender on the part of the society of access to its rooms, cabinet, and library; and the same privilege is extended to all the officers of vessels temporarily at the New York Navy-Yard. Contributions of books and pamphlets and curiosities are solicited from old members and friends of the society, particularly of books relating to naval affairs and maritime explorations.—*F. Hanford, Lieutenant U.S.N.*

Naval Officer. An officer in the naval service. A custom-house officer. See CUSTOMS.

Naval Songs. Lyrical poetry is the most ancient and enduring method of instructing the young, and of keeping alive the history and traditions of a nation.

With every intelligent people there is a natural curiosity to know something of past events, and of those who have rendered themselves illustrious. When, therefore, books were scarce and libraries unknown, metrical composition became a necessity. Those who could compose or recite high themes in pleasing numbers were held in great esteem; not simply that their verses delighted the ear, but because they instructed the heart and mind, and stimulated the memory to retain all that was good and noble and worthy of emulation in the past. These verses were not only repeated at high festivals and great banquets, but beneath the vine and fig-tree, and in the seclusion of home; the earliest lays that caught the infant ear told of the glories of other days. Thus was handed down from father to son the history of a race.

Of all the works of man, Song is the most enduring. The great Assyrian empire has crumbled into dust, Nineveh and Babylon, Tadmor and Baalbek have suffered Time's remorseless doom; and yet the Song of Moses, telling how the Lord delivered his people out of the hands of Pharaoh's hosts, is as fresh to-day as when Miriam and all the daughters of Israel raised their dark Jewish eyes to heaven and to the sounding timbrels sang praises to their fathers' God.

The Sacred Songs of David have carried hope and comfort to the hearts of thousands upon thousands; and the "Song of Songs," so old that its authorship is unknown, has told, and will for all ages continue to tell, of the ineffable pleasures of pure and faithful love.

The wrath of Achilles, the devotion of Patroclus, the noble actions of Hector, the love of Andromache, all embalmed in immortal verse, have served to incite countless generations of youths to deeds of daring. From the days when the Argonauts rowed in unison to the charmed melodies of Orpheus, the sailors of ancient Greece ceased not to enliven with song the labors of the oar. They chanted hymns on going into battle, and sang pæans in honor of victory.

Cato, the Censor, in speaking of the ballad poetry of ancient Rome,—unhappily lost,—said that many ages before his time there were ballads in praise of illustrious men, which it was the fashion for the guests, at banquets, to sing in turn while the piper played.

"Where," Cicero mournfully asks, "are those old verses now?" Valerius Maximus observes that the ancient Roman ballads were probably of more benefit to the young than all the lectures of the Athenian schools, and that to the influence of the national poetry were to be ascribed the virtues of such men as Camillus and Fabricius. This observation certainly lends weight to the oft-quoted remark of Andrew Fletcher, of Saltoun, who said, "I knew a very wise man that believed that, if a man were permitted to make all the ballads, he need not care who should make the laws of a nation."

We have the authority of Tacitus for saying that songs were the only memorials of the past which the ancient Germans possessed. The brave actions of the ancient Gauls were commemorated by their bards, and the ancient Skalds sang in Runic rhymes the deeds of the sons of the fjords.

The exploits of Athelstane were sung by the Anglo-Saxons; those of Canute by the Danes. The chants of the Welsh harpers preserved through ages of darkness a memory of Arthur, and the long struggle of the Servians against the Ottoman power was recorded in lays full of martial spirit.

The sea victories achieved by the heroes of modern times have not wanted poets to celebrate them in verse. The "Battle of the Baltic," by Thomas Campbell, will continue to tell of "Nelson and the North" long after St. Paul's shall have fallen into ruin. But the poet *par excellence* of the English navy was Dibdin. What was said of the effect of the ballads of ancient Rome in forming the character of the Roman youths is certainly true of the sea-songs of Charles Dibdin. He not only sang of England's naval heroes and their victories, but of the sailor and the sailor's life; of his loyalty, his courage, and his devotion. Most of Dibdin's sea-songs, indeed, are pervaded by a wholesome moral tone and an elevation of principle that could not but exert the happiest influence on the young.

"Poor Jack," quoting the chaplain, says:

> . . . "let storms e'er so oft
> Take the topsails of sailors aback,
> There's a sweet little cherub that sits up aloft,
> To keep watch for the life of poor Jack."

What more touching tribute to the memory of a departed shipmate than the lines to poor Tom Bowling? He was

> "The darling of our crew;
> No more he'll hear the tempest howling,
> For death has broached him to.
> His form was of the manliest beauty,
> His heart was kind and soft;
> Faithful below he did his duty,
> But now he's gone aloft."

The virtues of another tar are told of Tom Tackle, who

> "Was noble, was true to his word;
> If merit brought titles, Tom might be a lord;
> How gayly his bark through life's ocean would sail!
> Truth furnished the rigging and Honor the gale."

And so of Tom Transom, "a seaman sound to the backbone," and scores of others.

The great influence of Dibdin's songs may be estimated from the fact that in 1803 the British government engaged him to write a series of songs, "*to keep alive the national feelings against the French.*" His biographer adds, "His engagement ceased with the war *he thus assisted in bringing to a glorious close.*"

While Dibdin's songs of victory were being sung, not only on every forecastle, but in every town and hamlet of England, the infant navy of the United States found itself suddenly confronted by ships fresh from the glories of Trafalgar! When, therefore, the news spread over the country that the "Constitution" had captured the "Guerriere," an English frigate of about the same rating, there was scarcely any bounds to the popular enthusiasm. Songs were composed in honor of the event, and sung at public dinners, public meetings, and in the navy. For years after the close of the war of 1812, such songs as "Constitution and Guerriere," "Decatur and the Navy," "The United States and Macedonian," "The Hornet; or, Victory Number Five," contributed very materially towards keeping up the popularity of the navy. The Revolutionary war gave rise to comparatively few naval songs. One of them, however,—"Paul Jones's Victory,"—was for many years a great favorite in the navy. A memory of the *quasi* war with France is well preserved in "Truxtun's Victory":

> "Come all ye Yankee sailors, with swords and pikes advance,
> 'Tis time to try your courage and humble haughty France;
> The sons of France our seas invade,
> Destroy our commerce and our trade,
> 'Tis time the reck'ning should be paid
> To brave Yankee boys."

The war with Mexico gave rise to very few naval songs,—the late war of the Rebellion to very few.

That our old naval songs have died out is due in no slight degree to the comparatively small proportion of native-born seamen who have manned our ships. Of those who could claim to be Americans, many were interchangeable with the merchant service, so that the recognized body of American men-of-war's-men was extremely limited. Furthermore, there were no means of making good the waste by death, casualties, etc. The old type of sailor, therefore, died out, and with him passed away the songs and traditions of the old navy.

But a new era has opened for the American sailor. The training of boys for the navy will now yield a continuous supply of American men-of-war's-men of the best type. The songs which commemorate our early naval victories, once revived, could not fail to inspire the rising generation of seamen with that spirit of loyalty to their flag and devotion to duty which distinguished those who laid the foundation of our naval renown. (Macaulay's "Lays of Ancient Rome," Aikin's "Origin of Songs," Dibdin's "Universal Songster," London, 1827; "Songs for Sailors," W. C. Bennett; "The Book of Battle Songs and others.")—*S. B. Luce, Captain U.S.N.*

Naval Station, Key West, Fla. The naval station at Key West, Fla., is situated on the western side of the island, and directly on the harbor. It embraces 2¼ acres of land, with an L-shaped wharf. Length of wharf from store-house to water front 225 feet, and breadth 31 feet; length of water front 250 feet, with a breadth of 41 feet. The wharf contains a double railroad track and a heavy crane. Mean depth of water at low-tide at wharf is 18 feet, running abruptly to 25 feet, so that the largest ships can remain alongside at all times.

At the northern end of the station is the store-house, a heavy brick building of two stories, 184 by 80 feet, the brick-work of which was completed in 1857. The building underwent the necessary improvements at different times until it was finished in 1866, and has been used ever since as a store-house for the different bureaus, and contains offices for the officers of the station. The room at present occupied by the paymaster of the station was the first office of the International Ocean Telegraph Company in Key West.

Connected with the store-house are two cisterns containing 75,000 gallons each, which were constructed in 1862.

The next naval building is the coal-shed, built in 1868 of wood, 150 by 60 feet, capable of containing 2400 tons, and connected with the water front of wharf by a railroad track, but separated from the store-house by the U. S. custom-house, U. S. light-house building, and the lots called the Mallory property.

Next is the foundry, built of brick in 1873, 73 by 43 feet; and very near the foundry, at the southern end of the station, is the machine-shop, built of wood in 1862, 137 by 41 feet.

There are the following smaller buildings: 1 store-house, 25 by 16 feet, of wood; 1 store-house, 23 by 13 feet, of wood; 1 scale-house, 8 by 6 feet, of wood; 1 transit-house, 8 by 6 feet, of wood; 1 carpenter's shop, 23 by 17 feet, of wood. Total value of property, $230,000.

In 1874, on account of anticipated trouble with Spain, the North Atlantic, South Atlantic, and the greater part of the European fleets were ordered to Key West, numbering in all 26 vessels of every description, under the command of Admiral A. L. Case. Commodore F. A. Parker was detailed for special duty as chief-of-staff, to superintend the grand naval drill in accordance with his tactics. Four thousand men were landed on the south beach of the island, and were exercised in skirmish and battalion drill. In May of the same year, the trouble having been amicably settled, the fleets were dispersed to their respective stations, and the North Atlantic Squadron was left in command of Rear-Admiral G. H. Scott. In April, 1875, the fleet left this place on account of yellow fever, and it has never since that time been used as headquarters for the squadron.

List of line- and staff-officers from 1872 to the present time:

Line-officers.—Lieut.-Com. A. N. Mitchell, from 1872 to 1873; Commander A. E. K. Benham, from 1873 to 1874; Commander A. R. Yates, from April, 1874, to June, 1874; Lieut. J. K. Winn, from 1874 to 1875; Lieut. E. B.

Thomas, from December, 1876, to 1879; Lieut.-Com. J. K. Winn, from November, 1879, to the present time.

Paymasters.—Passed Assistant Paymaster Henry Girrard, from 1871 to 1872; Passed Assistant Paymaster F. C. Alley, from 1872 to 1873; Assistant Paymaster F. Clark, temporarily, 1873; Passed Assistant Paymaster F. Bissell, from 1873 to 1874; Paymaster A. J. Clark, from 1874 to 1875; Passed Assistant Paymaster E. Melach, from 1875 to 1877; Passed Assistant Paymaster H. C. Machette, from 1877 to 1879; Assistant Paymaster Wm. W. Galt, from 1879 to the present time. Passed Assistant Paymaster E. Melach was in charge of depot from 1875 to 1876.

Surgeons.—Acting Assistant Surgeon R. J. Perry, from April, 1872, to May, 1876; Acting Assistant Surgeon L. H. Armstrong, from May, 1876, to May, 1878; Acting Assistant Surgeon R. J. Perry, from May, 1878, to June 30, 1879, when he was discharged by the Hon. Secretary of the Navy, in accordance with act of February 15, 1879, to abolish the volunteer navy of the United States.

In February, 1878, by order of the Secretary of the Navy, this was made a station, and no longer included as a part of the Home Squadron.

One beautiful feature is the monument opposite the front entrance of the store-house, at the intersection of Whitehead and Front Streets, on land owned by the city of Key West, which was erected by the Navy Club of Key West in memory of the gallant officers, sailors, and soldiers of the U. S. army, navy, and marine corps who died while on duty on this station from 1861 to 1865.

Until Lieut. Thomas, who rebuilt the wharf and otherwise improved and beautified the station, assumed command, owing to very limited appropriations, very little care had been bestowed upon this monument and its surroundings, but one of his first acts was to have the lot on which it stands surveyed and inclosed in a neat picket-fence, grass-seed sown, and shade-trees planted; and his successor, Lieut.-Com. Winn, has continued to bestow the same solicitous supervision, so that each year it is becoming more beautiful in appearance and creditable to those who had it erected.

The importance of Key West as a naval station has never been overestimated by the government, and as far back as 1824 it was used as a rendezvous by the gallant Commodore Porter when in command of a fleet of gunboats engaged in cruising for pirates on the coast of Cuba and in the West Indies.

During the late civil war the port of Key West was brought prominently into notice by being the headquarters of the Gulf Squadron. It was the only port in the Gulf possessed by the government, until the capture of New Orleans and the evacuation of Pensacola.

Key West has a fine harbor, easy of access, and safe anchorage; 28 feet of water can be carried at all times through the southwest channel.

Naval ships of the class of the "Colorado" and "Niagara" have visited this port often, and have never experienced any difficulty in entering it.

Naval Station, New London, Conn. The New London Naval Station was established by the government in 1868. It is situated on the east bank of the Thames River, and about 6 miles from its entrance to the sound,—containing about 100 acres of land with a mile of shore front. The Thames River has depth for the largest vessels for some miles above the site, within the harbor of New London, reputed to be one of the best harbors on the Atlantic coast. It is about equidistant from New York and Boston, and has a fine, clear entrance to and from the ocean.

The government has made appropriations from time to time for improvements at this site; a wharf 800 feet long, 2 store-houses, and several other buildings have been constructed, and some 25 acres of ground has been graded to a proper level for the purposes of the yard.

Commodore T. A. Hunt was the first commandant; then Commodore R. Werden, who was succeeded by Commodore D. McN. Fairfax. Commodore Edward Simpson is the present commandant of the yard.

No vessels have yet been built at this yard, but it is considered admirably adapted for that purpose, and for the erection of any structures which may be required at a navy-yard, the foundations being solid and plenty of excellent granite close at hand. It was recommended by a board of officers in 1862, of which Rear-Admiral Stringham was president, and it is believed has the unanimous approval of all nautical men.

The "Dictator," "Florida," and other vessels of large draft have been at its wharf. The "Minnesota," the largest of the Training Fleet, commanded by Capt. Luce, is stationed there during the winter, with 500 or 600 men and boys in training. The site was a gift from the State of Connecticut to the government for naval purposes, and it has been recommended by the different Secretaries of the Navy as one of the best locations for a national navy-yard, as the Thames River never freezes, and is accessible from the sea at all seasons.

Naval Station, Port Royal, S. C. Port Royal possesses many natural advantages, one of the greatest being its salubrity of climate, which is much warmer than many places situated far south of it. The depth of water on the bar at the entrance to the harbor is 20 feet at dead low-water, with a mean rise and fall of tide of between 6 and 7 feet, and as it is from 200 to 300 miles nearer to all the Southern and Western shipping centres than New York, this fact of itself would seem to insure its eventually becoming a place of importance; but, in addition to this fact, it is the only place on our whole coast between Norfolk and Key West which has this great depth of water in the harbor, and at the same time is large enough to afford shelter to our largest ships of war, and where a naval station possessing the requirements for refitting and replenishing our squadrons could be established. But before establishing such a station it would be necessary to select the site beyond the reach of an enemy's long-range guns, and to have the approaches defended by fortifications which an enemy would not attempt to pass.

Port Royal was first occupied by Rear-Admiral Dupont in 1861, and continued an important naval station until 1865, since which time its importance has been decreasing until the present time, when, although the vessels of the North Atlantic Squadron may obtain supplies

of nearly every description, there are no facilities for repairs.

Although no ships have ever been built, the government had large shops established here during our late war, where repairs of nearly every description could be effected. The town of Port Royal is gradually increasing in mercantile importance, and capitalists are realizing the fact of its many natural advantages, and recently large and extensive docks and a large steam cotton-compress have been constructed, and a grain-elevator and cotton-factory are now under contemplation.

The harbor of Port Royal was the rendezvous for our ironclad fleet until the spring of 1877, and after its removal the "New Hampshire" was converted into a training-ship for apprentices; but owing to her being so heavily sparred as to render anything like seamanship evolutions impossible, the apprentices, 60 in number, were, in June, 1879, transferred to the other training-ships, since which time she has been used as a store- and receiving-ship, the only other permanent vessel being the "Pawnee," which is used as a store-ship for coal.

The station has generally been commanded by a flag-officer, the first being Commodore I. M. B. Clitz, who was relieved, in the spring of 1877, by Commodore A. K. Hughes, who remained in command until August, 1878, when he was succeeded by Commodore George M. Ranson, who was relieved by Commodore Thomas Pattison, in January, 1879, and he was succeeded, in August, 1880, by Capt. James E. Jouett.—*W. E. Whitfield, Ensign U.S.N.*

Naval Stores. Ship's stores.

Naval Tactics (Greek *τακτικος*, capable of being arranged, as in the order of battle). Tactics may be defined as the art of military movements. Naval tactics comprehend those evolutions which are designed to bring the ships of a fleet or squadron into a determined order, or to change them from one order to another. They have for their object the conducting, according to certain rules, of a naval force in and out of port; anchoring and getting it under way; navigating it on the high seas; the formation of the line of battle; the pursuit of any enemy; the protection of a convoy; retreating from a superior force; and, when the several ships of the command have been dispersed by battle, by the violence of the elements, or other cause, their restoration to any one of the recognized orders. These various movements, and the evolutions necessary to effect them, are to be found in the Signal Book (see SIGNALS), each evolution being accompanied by a diagram showing the movement of each ship of the command.

On paper they appear so simple that the possibility of mistakes seems remote indeed; and yet we have the melancholy examples of the "Vanguard," the "Grosser Kürfurst," a collision between two ironclads in the French navy, and the sinking of a Russian man-of-war while engaged in tactical evolutions, to say nothing of numerous collisions of lesser note, to show that nothing but the school of actual and continued practice will ever enable officers to handle their ships so skillfully as to insure the invariable success of fleet evolutions. If the weather were always pleasant and the sea smooth; if signals could always be read with certainty and correctly interpreted; if the several ships of the command were all homogeneous; if they all maintained the same speed, and under similar circumstances described equal arcs of evolution, the manœuvring of a fleet would be comparatively easy. But these conditions are rarely, if ever, fulfilled. Scarcely any two ships will be found possessed of the same facility of turning, or able to maintain the same speed under varying circumstances. Hence the following definitions:

The co-efficient of speed is the ratio between the number of revolutions per minute of the engines of a given ship and those of the flag-ship, when the speed of both is the same.

The co-efficients of helm are the ratios under various conditions of speed between the angles of a given ship's helm and those of a flag-ship's helm, when both are describing the same circle.

Every ship of a command should know its own co-efficient of speed and its own co-efficients of helm for different rates of steaming. Every ship should know, also, the mast-head angles of every other ship of the command, both for open and for close orders: 2 cable's lengths, or 240 fathoms, and 1 cable's length, respectively. This is the only means by which the proper distances may be observed. Distances are reckoned from mainmast to mainmast.

An assemblage of vessels of war takes the name of fleet when it consists of 12 or more ships of the line, or vessels of equal military value; dispatch-boats, transports, etc., are not considered.

A naval force of less than 12 line-of-battle ships, or vessels of equal military value, takes the name of squadron or division, according to its numerical strength.

A fleet is separated into three divisions of one, two, or three squadrons each, each squadron comprising not less than four vessels.

The command is distributed as follows: the commander-in-chief commands the fleet, the second in command the van division, the third in command the rear division, the fourth in command the centre.

The smaller and lighter vessels constitute the light squadron; the transports, the convoy.

The reserve division should be about one-fourth the strength of the whole fleet, and be drawn equally from the van, centre, and rear divisions.

There are but three formations, any one of which may form an order of battle, viz.:

1. *The line* (Fig. 1), in which the ships are ranged on a line at right angles to the course; in natural order when the van is on the right, inverse order when it is on the left.

2. *The column* (Fig. 2). Single column is when each ship follows in the wake of the leading ship; double column when the two leading ships are on a line at right angles to the course, and at a prescribed distance from each other, and the two columns are parallel. The column is in natural order when the van is leading, in inverse order when the rear squadron or division is leading.

3. *The echelon* (Fig. 3), when the ships of the command steering the same course are ranged on a line of bearing four points from the course. *Double echelon* is when there are two such lines of bearing, the two wings forming a right angle, as in Fig. 4. The echelon is in natural order when the van is on the right, in inverse order when it is on the left.

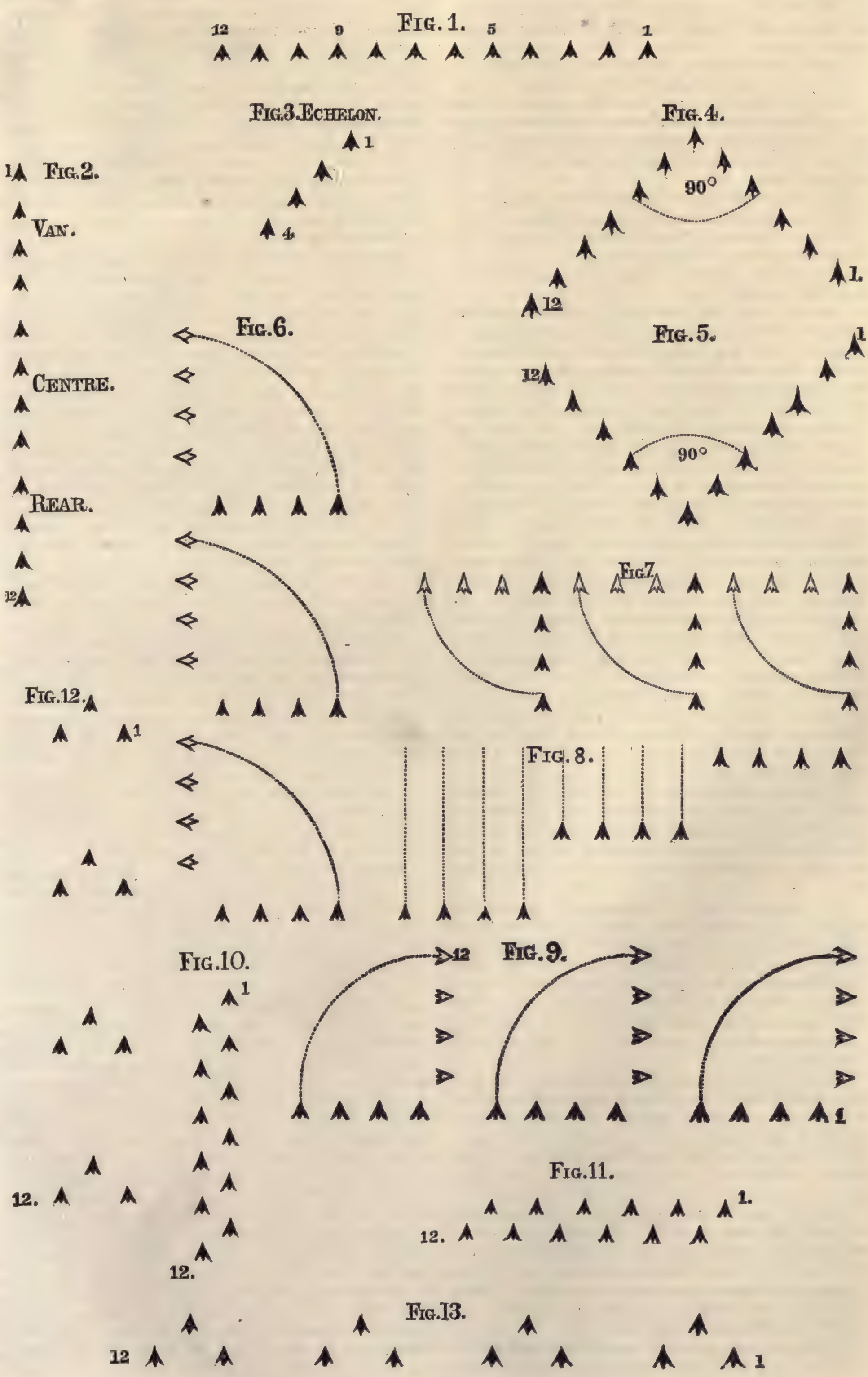


FIG. 1.
FIG. 2.
VAN.
CENTRE.
REAR.
FIG. 3. ECHELON.
FIG. 4.
90°
FIG. 5.
90°
FIG. 6.
FIG. 7.
FIG. 8.
FIG. 9.
FIG. 10.
FIG. 11.
FIG. 12.
FIG. 13.

When the ships steer in direct double echelon, as in Fig. 4, they are said to be in the *offensive order*, or *order of chase*. When reversed, as in Fig. 5, the order is termed the *defensive*, the *order of retreat*, or the *order of convoy*.

The foregoing constitute the simple orders. Compound orders are those wherein the squadrons or divisions, considered as units and in the same formation, are ranged on one of the simple orders, thus:

Fig. 6, a column of squadrons or column of fours, in natural order, heading north.

Fig. 7, columns of vessels abreast by squadrons, in natural order, heading north.

Fig. 8, in echelon of squadrons, natural order, heading north.

Taking now the two simple orders, *line* and *column*, and regarding the ship as a company of infantry and the squadron as a battalion—or, better still, the ship as a section of artillery and the squadron as a battery—we have only to apply the rules of military tactics to enable us to form the command in any desired order. The fleet being in line, for example, heading north (Fig. 1), let it be required to form column of squadrons to the right. The commander-in-chief signals, *Fleet, by squadrons, wheel to east.* The movement is then effected as in Fig. 9. The column may be brought into line again by a left oblique movement of the centre and rear, or by Fig. 6. From this it would appear that Admiral George Monk, whilom chief of artillery under Cromwell, was simply wiser than his generation when he moved the mirth of the sailors by calling out, "Wheel to the right!" when he wanted to tack ship.

The foregoing is a summary of what is called *elementary tactics*, that branch of the art of war which immediately precedes *grand tactics*, or the tactics of battles, *strategy* being the highest branch, for which reason it has been called the science of generals.

In what order soever the fleet may be formed, whether at anchor or under way, the ultimate object of elementary tactics is the formation, in the most expeditious manner possible, for battle; the two first branches above named, therefore, merge in

The order of battle. This, in the sail-period, when ships carried their batteries in broadside only, and depended on the wind for the motive-power, was the close-hauled line ahead. The tactical order of battle of the steam-period is the column (Fig. 2) for vessels carrying their batteries in broadside, and the line (Fig. 1) for vessels whose offensive powers lie in the ram and "end-on" fire.

But the single line, by its liability to be broken or doubled up, is considered the weakest of all recognized orders of battle. The ablest tacticians of both ancient and modern times have therefore doubled the line (Figs. 10 and 11), and added a reserve to strengthen any particular point at will.

With a view to the formation of a strong line of battle, as well as facility of manœuvring, and a system of mutual support, the French have introduced into their system of tactics the *peloton*, or groups of three vessels acting together. Thus, in Fig. 12 we have the column of *pelotons*, and in Fig. 13 the *pelotons* in line.

The expression *order of battle* is, in fact, an arbitrary term applicable to any disposition of a fleet for battle which the commander-in-chief may adopt to suit the occasion. Conon, Phormio, Alcibiades, Themistocles, the Athenian fleet at Arginusæ, the Roman fleet at Ecnomus, Cæsar at Alexandria, Agrippa and Antony at Actium, afford some admirable illustrations of orders of battle of the ram-period,—the period, in fact, to which we have returned.

Of the naval powers of modern times the French have paid most attention to naval tactics, though in actual warfare they were charged, during the sail-period, with a somewhat too close adhesion to rules.

De Grasse, after the action of 12th of April, 1782, justified himself against the charges brought against him by the other flag-officers of his fleet by pleading his compliance with the *Ordonnance du Roy*, which specified a particular line of conduct under similar circumstances. Rodney's fleet being to leeward, was enabled by a shift of wind during the action to lead through the enemy's line. The *Ordonnance* prescribed that the French fleet was then to tack together. De Grasse made the signal for that purpose, which was not obeyed by M. de Vandreuil, the second in command, and his squadron, under the pretense that no man in his senses would have ordered such a manœuvre under an enemy's fire. An eminent French writer notices the same defect, and ridicules what he terms the pious regard of his countrymen for the "sacred order of the line of battle" to which the combined fleets were sacrificed at Trafalgar.

While Nelson advanced in two close columns to overwhelm the centre of this "sacred line" the two wings remained immovable; they were "in line," he says, and that was enough; and in this position they looked on "*avec une effrayante impassibilité*" until the centre was destroyed; then, and not till then, forgetting all respect for the "sacred order of the line," they thought, not of seeking to remedy any part of the evil, but of making their escape. (See "Fleet Tactics Under Steam," by Commodore F. A. Parker, U.S.N.)—*S. B. Luce, Captain U.S.N.*

Naval Training System. In 1835, Mr. John Goin, of New York, first suggested the idea of opening nautical schools for boys wishing to follow the sea as a livelihood. There was such a large proportion of foreign seamen in both the national and mercantile marines, that the training of boys for the sea was thought to be the only means of manning our fleets with native-born Americans. The press advocated Mr. Goin's proposition with much zeal. When the subject was brought to the attention of Congress, an act was passed (approved March 2, 1837) making it lawful to enlist boys for the navy (with the consent of their parents or guardians) not under 13, nor over 18 years of age, to serve until 21. Under this act enlistments commenced at once and proceeded with vigor, the boys being sent to the "Hudson," frigate, then a receiving-ship at New York, to the line-of-battle ships "North Carolina" and "Columbus," and to the "Java," frigate, the receiving-ship at Norfolk. The Secretary of the Navy in his instructions to the commanders of ships having boys on board, directed that they (the apprentices) were to be thoroughly instructed, so as to best qualify them to perform the duties of seamen and petty officers. In his annual report of November 30, 1839, the Secretary

says, "Should this system of apprenticeship be carried to the extent of which it is susceptible, I look forward to it as a source of great and lasting benefit to the navy. There is every reasonable prospect of its becoming a nursery for the supply of petty officers, one of the most important constituents in the service; nor can I doubt that it may be made the means of supplying a large number of capable, intelligent seamen, more strongly attached to their country by the benefits she has conferred on them." But the idea got abroad that the apprentice-boys were in time to be advanced to the grade of midshipmen, and thus enter the line of promotion to the highest rank. Many boys of excellent family enlisted under this impression. By dint of political influence two or three of the enlisted boys were appointed midshipmen. This had the effect of rendering the less fortunate ones discontented with the service. This, with the discovery of the true nature of the apprentice system as set forth in the letter of the Secretary of the Navy, caused a general clamoring for discharges, and as these applications were backed up in most cases by strong political influence, they were generally successful. Failing to obtain their discharge, many deserted. The apprentice system of 1837 lacked organized effort, cohesion, stability,—in short, every element of permanency. After lingering a few years it finally died out.

In 1863 a report was made to the Navy Department on the training system of the English navy, with a recommendation that a similar system be adopted for the U. S. navy. The recommendation was so favorably received that the Department authorized (circular of March 27, 1874) the resuming of the enlistment of boys under the provisions of the act of March 2, 1837. The "Sabine," frigate, was selected as the school-ship, and in due course of time the "Saratoga" and "Portsmouth" were added. For a time everything proceeded so well as to justify the most sanguine hopes. Unfortunately, the Secretary of the Navy, in his annual report for 1864, gave expression to the following views in relation to the boys on board the "Sabine": "Commencing as apprentices on the school-ship, it would be well to open to the sailor-boy the way to promotion by giving him an opportunity, if he shall deserve it, of entering the Naval Academy. From among the apprentices on the school-ship a selection of one-half of the midshipmen annually appointed might be made with great advantage to the service and the country. . . . It would popularize the navy, and open to those who may have enlisted the highest positions and honors of the service." In accordance with these views a limited number of apprentice-boys were sent every year to the Naval Academy to be examined for admission. There followed naturally a repetition of the experiment of 1837. Many boys of our best families, having failed to secure appointments to the Naval Academy in the usual way, had enlisted for the sole purpose of gaining admission into that institution. Failing in their object, and having no longer a motive for remaining in the service, some obtained their discharge, others deserted. Among the several school-ships there seems to have been no concert of action; there was no controlling power, no head,—in short, no system. The experiment of 1864 lingered, like its predecessor, for a few short years, and, like it, died out.

Under date of November 12, 1872, the subject of training-ships was again brought to the notice of the Navy Department, but failed for the time to gain the attention its importance deserved. In the meanwhile the Legislature of the State of New York passed an act to establish a nautical school "for the education and training of pupils in the science and practice of navigation." To aid this school, and to encourage other States to follow the example of New York, Congress passed the "Marine School" bill (approved June 20, 1874), authorizing the Secretary of the Navy to furnish a suitable vessel of the navy to any nautical school established at the ports of New York, Boston, Philadelphia, Baltimore, Norfolk, or San Francisco. Under the provisions of this act the Navy Department turned over to the city of New York for the use of her nautical school the old sailing sloop-of-war "St. Mary's," to be used as a school-ship. Shortly after the "Jamestown" was loaned to the city of San Francisco for the same purpose. The latter, however, was soon given up. Stimulated, perhaps, by the example of New York, the Navy Department, under date of April 8, 1875, issued a circular stating that a limited number of boys between the ages of 16 and 17 years would be enlisted under the provisions of the act of Congress of March 2, 1837. The steam-frigate "Minnesota," then flying the flag of Vice-Admiral S. C. Rowan, at New York, was designated as the school-ship. As yet the number of boys enlisted had to be taken from the 7500 men allowed the navy by Congress. As this drain on the complement of men hampered the operations of the navy, an act was passed (approved May 12, 1879) authorizing the enlistment of 750 boys over and above the complement of 7500 seamen, and reducing the age of admission from 16 to 15 years. The Navy Department thereupon issued the following:

"*Circular relating to the Enlistment of Boys in the U. S. Naval Service.*

"NAVY DEPARTMENT, WASHINGTON, May 31, 1879.

"The circular of April 8, 1875, relating to the enlistment of boys in the U. S. naval service, is hereby rescinded, and the following substituted, in accordance with the amendments to the Revised Statutes of the United States, approved May 12, 1879, to wit:

"'SECTION 1418. Boys between the ages of fifteen and eighteen years may be enlisted to serve in the navy until they shall arrive at the age of twenty-one years, etc., etc.'

"'SECTION 1419. Minors between the ages of fifteen and eighteen years shall not be enlisted for the naval service without the consent of their parents or guardians.'

"'SECTION 1420. No minor *under the age of fifteen years*, no insane or intoxicated person, and no deserter from the naval or military service of the United States shall be enlisted in the naval service.'

"These boys will be sent on board of suitable vessels, to be trained for the naval service, under the following regulations:

"Every boy previous to being enlisted must satisfy the Examining Board of Officers—

"That he is of robust frame, intelligent, of perfectly sound and healthy constitution, free from any physical defects or malformation, and not subject to fits.

"That he is able to read and write.

"In special cases where the boy shows a general intelligence, and is otherwise qualified, the Examining Board, if they think fit, may enlist him, notwithstanding his knowledge of reading and writing is imperfect.

"That his height and measure are sufficient, being as follows:

Age.	Height.	Weight.	Chest Measurement—breathing naturally.
Fifteen years	4 feet 11 inches.	85 pounds.	27½ inches.
Sixteen "	5 " 1 inch.	90 "	28 "
Seventeen "	5 " 2 inches.	100 "	29 "
Eighteen "	5 " 3 "	110 "	30 "

"The education of the boys will comprise the elements of an ordinary English education, alternating with practical seamanship and other professional occupations designed to prepare them for *sailors* in the navy.

"The prime object is to place in the naval service, with the consent of their parents, such good and deserving boys as will elevate its standard, and make the navy more reliable as an arm of the national defense. Boys who have been convicted of crime cannot, therefore, be received, as it is not advisable that they should become the associates of the better class.

"The boys will be enlisted as third-class boys, at the rate of $9.50 per month and one ration. While serving on the training-ships, they may, if deserving, be promoted to the rating of second- and first-class boys, at the pay of $10.50 and $11.50 per month, respectively, and on cruising-vessels will be entitled to higher ratings, at the discretion of their commanding officers, as a reward of proficiency and good conduct."

At the present date (October 19, 1880) the training-ships "Minnesota," "Constitution," "Saratoga," and "Portsmouth," having on board a total of 715 boys, have been assembled at Hampton Roads for the purpose of being inspected by the Secretary of the Navy; after which they will be sent to different ports to resume enlistments.

The present system has been in operation about five years; just about the lifetime of the experiments of 1837 and 1864. It is yet to be seen whether it will meet with the fate of its predecessors, or justify the hope expressed by Mr. Secretary Paulding in 1839, "that it will be a great and lasting benefit to the navy."—*S. B. Luce, Captain U.S.N.*

Naval Training Systems, Foreign. Schools have been established by most of the more important naval powers of Europe for the training of the men of their fleets, both naval and mercantile,—England, France, Germany, Italy, and Holland having well and completely organized systems for this purpose. The importance of so doing was recognized by these long before it was felt by the government of the United States, which has, until within the last five years, had nothing of the kind which might be called a system.

England, of course, as being pre-eminently a naval and mercantile power, has taken the lead, and has at present, all things considered, the most complete and satisfactory methods of training her sailors. There are at present employed in this duty in the United Kingdom five line-of-battle ships (with brigs as tenders) for the navy, and twenty large ships for the boys intended for the merchant service; two ships of the latter class are for the education of officers only. There are besides these, at several of the great industrial (reformatory) schools, vessels built ashore, from the berth-deck up, which serve for the training of boys who evince a taste for the sea; at Hull is a special free school for the teaching of navigation (established under an old endowment), and finally, at Greenwich is a government school for the sons of seamen, in which are at all times 1000 boys, who are admitted between 10½ and 13 years of age and retained until 15½ years, when they are sent into the navy, if physically fit. All the foregoing establishments are for young boys who have not been to sea; for the further training of seamen in the navy, there are the gunnery and torpedo schools at Portsmouth and Devonport, established on board the "Excellent" and "Cambridge," to each of which ships are attached several other vessels as subsidiary schools.

To take first the navy: the five line-of-battle ships are stationed,—the "St. Vincent" at Portsmouth, the "Boscawen" at Portland, the "Impregnable" and "Implacable" at Devonport, the "Ganges" at Falmouth. In these, at present writing (September, 1880), there are a few over 3000 boys, 2400 of which are the entries of this year. The number entered varies with the demands of the service, and is estimated to be such as will fill the vacancies in the blue-jacket class of the navy. The total number in this class is about 19,000 out of the 30,000 men of the navy, so that the annual waste of the blue-jacket class may be estimated as about 12 per cent.

The boys are received from 15 to 16½ years of age, and undergo a training which lasts through 16 months before being ready for sea-service. When first received he is placed for a week on board a hulk, which is used as a tender to the parent ship; he is there supplied with his clothing and bedding (which is given him free of charge), takes a daily bath, is taught to lash his hammock, stow his clothing, and made to learn many other small details which are necessary to enable him to take care of himself when he goes on board the training-ship.

The training received thereafter is divided between school-work, drill, and practical seamanship in the brig tender. The schooling consists in learning reading and writing from dictation; arithmetic, to include decimals; geography, and religious knowledge. Daily exercises in drills of various kinds take place; boat sailing and pulling, swimming, signaling, etc., are taught, a special class of boys being selected for the last. In April the brigs are ready for sea and the boys are sent on board, about 100 at a time,—as they are prepared,—for a cruise of six weeks or two months, in the vicinity of the parent ship; they are then sent to the gunnery-ship for a six weeks' course in gunnery, after which they are ready for sea-service. At 18 years of age they are rated ordinary seamen, or ordinary

seamen, 2d class, and serve from that time until they are 28, which is the end of the period for which they are bound. The bandsmen and buglers of the English service are also trained in these ships, boys not under 14 years of age being received for this purpose.

The entire system is under one head, the captain of the "Impregnable"; all the other ships are commanded by commanders, who refer all questions relating to the training-service to this officer. A complete system of regulations has been adopted, which is rigidly adhered to, so that every ship is supposed to be doing the same thing at the same time; rigid uniformity is sought, so that the boys turned out from one ship are quite the same as those from either of the others; this has great benefits, as it tends to make a perfectly homogeneous mass of the seamen of the fleet.

The ship's writers, ship's steward's boys, schoolmasters, yeomen, etc., of the British fleet, are furnished from the Greenwich Hospital School, these being specially selected from the mass of boys, and specially trained for their duties; the remainder of the boys are sent, on arriving at the age of 15½, to the training-ships, where they take a front rank on account of their previous excellent training. The school has a sloop-of-war built in its grounds from the berth-deck up, on which the boys get their seamanship training. They also have excellent working models in the school-rooms. The education given at this school is excellent throughout, making it in many respects a model school. It is on the half-time system, in which half the time is given to the learning of trades, those being taught which go to make the establishment as self-supporting as possible, such as mattress-making, tailoring, shoe-making, etc.

The course of those intended for schoolmasters covers a period of six years after they are selected for such training. While undergoing this course, which is divided into three periods of two years each, they are termed pupil teachers. The first period is passed at Greenwich, the second on board the training-ships, and the third again at Greenwich. During all these years their time is largely taken up with teaching, though a fixed and very difficult course of study is laid down for themselves. The result is that the British navy is supplied with one of the most efficient and able body of schoolmasters in the world. Too high praise can scarcely be given them as a class.

To complete the naval training there are, as aıefore stated, the gunnery-ships and their adjuncts, in the training of the older seamen. The course on board these ships includes everything connected with the subjects of practical gunnery and ammunition; it is usually for six months, but many of the men stay three years. There are at this time in the British navy 3000 seamen gunners, and 6000 trained men who have undergone the course in whole or part.

For the mercantile marine there are the "Conway," at Liverpool, and the "Worcester," in the Thames, for officers; the "Indefatigable," at Liverpool, for the sons and orphans of sailors and for destitute boys; the "Warspite," off Woolwich, for poor boys; the "Shaftesbury," off Grays, in the Thames, under the jurisdiction of the London School Board, for boys who desire a sea-training; and the "Exmouth," at the same point, for pauper boys. The remaining vessels, the "Akbar" and "Clarence," in the Mersey, the "Chichester," "Arethusa," and "Cornwall," in the Thames, the "Cumberland," in Row Bay, Scotland, the "Formidable," "Bristol," "Gibraltar," at Belfast, "Havannah," at Cardiff, "Mars," at Dundee, the "Southampton," at Hull, the "Wellesley," in the River Tyne, and the "Mount Edgecumbe," at Devenport, are all ships of the reformatory class, in which are received convicted boys. The great number of such ships militates much against the successful training of boys for the merchant service, as it gives the service itself a bad character to have so many boys of this kind sent into it. The aim should be to raise the tone of the merchant sailor by inducing the better class boys to enter, and there are very few ships in England where boys of this class are received. The training given in all the ships above mentioned is the teaching the duties of the sailor in general. The elements of an English education are likewise given. The most successful appears to be the "Exmouth," in which the drill, discipline, and general appearance of the boys are most admirable. About 600 boys are kept in this ship, which in three years has sent over 200 boys to sea, and 30 into the army,—the latter as musicians.

The "Warspite," supported by voluntary contributions, is under a society which was founded in 1772, and since that time has sent 59,000 boys to sea. All the other ships have been founded within the past 30 years, and most of them are of much later date.

The reformatory (or industrial) school-ships are largely supported by government grants, and all have in addition large sums given by subscribers. The total amount expended on these various ships is about £90,000, the expenditure per boy being about £20, there being about 4000 boys under training.

The "Conway" and "Worcester" are practically nautical colleges, which are supported by the fees of the pupils, 50 guineas a year being charged for the two terms in each year. As neither ship has a tender, the nautical practice in the two years on board is limited. The schooling given includes trigonometry, navigation, nautical astronomy, French, and some steam-engineering. The boys of these two schools have been very successful in the merchant service.

In France there is a school similar to the Greenwich Hospital School, of England, which receives the sons of sailors to the number of 400; a ship (the "Austerlitz") which has a complement of 800 boys, who are received between 13 and 14 and kept until 16, when they are transferred for further instructions to the "Bretagne." In this latter ship are nearly 1400 young men and boys under instruction, who are taken (with the exception of those from the "Austerlitz") from the various *divisions* established at the five principal naval ports and trained for specialties. All the foregoing are at Brest, which may be esteemed the headquarters of the French naval training system. After from four to six months' training on board the "Bretagne" (to which a small frigate is attached, which daily gets under way, being manned for a week at a time by one of the six companies into which the "Bretagne's" complement is divided) the young appren-

tices are distributed to the various schools of specialties: to the cruising training-ships (of which there are two), to train as topmen, and for quartermasters and signal-men; to the school of musketry at Lorient (a fifth of the ship's company of a French man-of-war being made up of these sailor-musketeers, no marines going to sea); and to the gunnery school at Toulon (similar to that on board the "Excellent," at Portsmouth). About 8000 men are at all times in the *divisions*, who undergo such instruction as can be given there; they are housed in capital barracks, and have at hand excellent means for drill and instruction otherwise than in seamanship. Each division has its permanent *cadre*, and has in divisions of the first class (those of Brest and Toulon) one company of seamen-gunners, one company of musketeers, one company of machinists and firemen, three companies of men of the *Inscription Maritime*, and one company of volunteers or conscripts. The *divisions* of the second class (Cherbourg, L'Orient, and Rochefort) have one company of seamen-gunners and musketeers, and two companies of *inscrits-maritimes* and recruits. Excellent schools have been established at the divisions, and there are good libraries open to the men, and means of amusement and exercise. Schools are established also on board of each ship, which are held four days in the week, such returns being made by the commanding officer that there is no chance of avoiding the regulations regarding these.

The French sailor is thus becoming a far less illiterate man than those of a few years since, 22 per cent. of the ship's companies knowing how to write and cipher in 1878, and 58 per cent. additional being able to read and write a little, but not to cipher.

The schoolmasters of the French navy are educated at Rochefort, where there is a normal school for that purpose; they are selected from the men of the service who desire to undertake these duties and are considered fit for them. The course comprises grammar and composition, arithmetic, French history, and geography in its principal branches.

To all the preceding should be added the school for firemen and machinists at Toulon, the training of instructors in gymnastics in the army school at Joinville le Pont near Paris, and the school of coast pilots, which furnishes pilots to the fleet, in ships which are employed on the French coast.

In each of the large ports of France are established schools for the free teaching of navigation to officers in the merchant service. The close connection of the navy and mercantile marine in France does away to a great degree with the necessity of specially training boys for the latter, as nearly all the merchant sailors in deep-sea ships are men of the *Inscription Maritime* who have taken service in these after having completed their time of service in the navy.

Germany has 400 boys at all times under training, the course lasting three years. They are received in October and spend the winter in barracks; in the spring they are placed on board ship for the summer, but do not leave the Baltic; in the fall they go again into barracks, and the succeeding year make a cruise at sea of eight months, and then return again into barracks. A very complete routine, which compels a great deal of work, is laid down; the ships in which they go to sea are fitted and laid up by the boys themselves; much infantry is taught, long marches being taken, and the whole course is a very rigorous one. These boys become the warrant and petty officers of the German navy, and certainly, if training can make good men, they are such. At Wilhelmshaven is the gunnery school of the German service, similar to those of the French and English. The Germans also have a school of pilots, and one for engineers and firemen.

Italy has also its school for seamen and for firemen, the course followed being similar to that of the French. Holland also trains the larger number of its men; indeed, throughout Europe a very great attention has been wisely given to this subject, and the sailors of the fleets of its greater powers are a very superior class of men to those of even a decade since.—*F. E. Chadwick, Lieutenant-Commander U.S.N.*

Navel Laver. The sea-weed *Ulva umbilicus.*

Navigable. Capable of being passed by ships or boats.

Navigant. An old word for sailor.

Navigation (Lat. *navigo*, to sail, from *navis*, a ship, and *ago*, to do business) may be defined as the art or science of conducting a ship from one part of the world to another.

The two fundamental problems of this art or science are, first, the determination of the ship's place at the present moment, and, second, the deciding on the future course to be steered to reach the desired port with the least delay and the least wear and tear of the vessel, and, if in a steamer, with the least expenditure of coal.

The limits of this article will not admit an elaborate account of the history of navigation, but it will be interesting to glance at a few of the improvements and discoveries which have gradually made the task of the navigator easier and his results more accurate.

Although the mariner's compass is supposed to have been used at an earlier period among the nations of the East, it was not commonly used by Europeans till about the year 1420. Until that time navigation was of a very rude and uncertain kind, being chiefly confined to coasting; when out of sight of land, rough bearings of the heavenly bodies affording the only indication of the course sailed. In 1485, Martin de Bohemia, a native of Fayal, calculated tables of the sun's declination for the use of navigators, and recommended the use of the astrolabe, an instrument consisting of a graduated circular arc, with sight attached for measuring altitudes of the sun and stars.

The variation of the compass was discovered about 1492, the credit of the discovery being claimed by Christopher Columbus and by Sebastian Cabot.

The first treatise on navigation in the English language appeared in 1561, being translated from the work of a Spanish author named Cortez.

About 1569 the first chart on Mercator's projection, so called, was published.

Early in the 17th century logarithms were invented by Baron Napier, and have proved of inestimable service to the art of navigation.

About the beginning of the last century, Sir Isaac Newton invented the reflecting sextant, which is still the principal instrument in nautical astronomy. See SEXTANT.

Among the later discoveries in navigation, that of finding the longitude with accuracy is the principal. To Dr. Nevil Maskelyne, an English astronomer, who determined the method during a voyage which he made to St. Helena in 1761 to observe the transit of Venus, we are indebted for the means of solving this problem by lunar observations, and to the rewards offered and paid by the British government the present degree of perfection of the solution by means of time-keepers is due. Of late years, probably the invention of the widest usefulness is that by Capt. T. H. Sumner, of finding a ship's position at sea, which will be described hereafter. Although known and practiced before Capt. Sumner's publication, it is now universally known as Sumner's method, and has been elaborated by many others, notably by Lieut. de Magnac, of the French navy, and Sir William Thomson.

Generally speaking, the place of a ship at sea is found by one of the four following methods: (1) by reference to one or more known and visible landmarks; (2) by ascertaining by sounding the depth of water and character of the bottom; (3) by calculating the direction and distance sailed from a previously-determined position; and (4) by ascertaining the latitude and longitude by observations of one or more of the heavenly bodies. See LATITUDE, LONGITUDE.

The first of these methods is readily employed when known landmarks are in sight, by determining simultaneously their bearings by compass, and laying off on the chart the lines of direction from these terrestrial points, when the place of the ship must necessarily be at the intersection of the lines of bearing. The exact position of the ship with regard to any landmark by which the ship is sailing is also determined by successive angles between the ship's course and the bearing of the landmark, in connection with the distance sailed between the bearings.

In thick, foggy weather, or at night, when not in the vicinity of a light-house, the second method becomes of great importance. When the depth of water is less than about 100 fathoms, a ship is said to be on soundings, and when near, though out of sight of land, the skillful navigator can, with the aid of the chart, ascertain a ship's place, and direct her course frequently with great accuracy by observed changes in the depth of water, or in the character of the bottom, as the ship proceeds on her way. See LEAD.

The third method is known as *Dead-Reckoning*, and consists in calculating from the recorded courses and distances the ship has sailed (see LOG) the amount of change in latitude and longitude to be applied to a previously-ascertained position to determine the present one. For this purpose the compass gives the direction the ship sails, and by the log is measured the distance on each course. Where the distance involved is small, no great error will be made by considering that part of the earth's surface sailed over as a plane, and when any two of the four elements, course, distance, difference of latitude, and departure, be given, the others may be found by the solution of a right-angled plane triangle, the term departure being understood as the distance in nautical miles made by the ship toward the east or west. This method of solution is known as *Plane Sailing*. *Parallel sailing* is employed where a ship's track lies along a parallel of latitude. *Middle-latitude* sailing is a combination of plane and parallel sailing, and is founded on the consideration that the arc of the parallel of middle latitude between two places, intercepted between the meridians of those places, is very nearly approximate to the departure.

Mercator's sailing is founded on the principles which govern the construction of Mercator's chart, in which all the meridians are parallel to each other, but proportionally lengthened, so as to conform to the spherical figure of the earth. (See CHART.) This method accurately solves the problems of spherical sailing, and is characterized by the use of a table of *meridional parts* found in all treatises on navigation.

If the course and distance sailed could always be accurately determined, the place of the ship could be computed with sufficient exactness by *dead-reckoning*, but these data can be only roughly approximated owing to errors in the estimated distance sailed, to unknown currents, faulty steering, errors in the assumed variation of the compass, or in its local deviation, and numerous other uncertainties. For this reason, when the weather will permit, a careful navigator loses no opportunity of determining the position of the ship by observations of the sun, moon, and stars.

Astronomy thus applied to navigation is termed *nautical astronomy*, and, concisely speaking, the problems solved by its practice are the determination of the latitude, the longitude, and the error of the compass by which the ship's course is directed.

For such determinations the navigator must have a sextant or quadrant (see SEXTANT, QUADRANT) for measuring the altitudes of heavenly bodies above the horizon, or their distances from each other, a watch or other time-piece to mark the instant of an observed altitude, distance, or bearing, one or more chronometers (see CHRONOMETER) to show the time at the first meridian, a nautical almanac (see NAUTICAL ALMANAC), an azimuth compass (see COMPASS), and a set of tables for facilitating computations. These tables are contained in all treatises on navigation, and are also published separately.

The simplest problem of nautical astronomy is the determination of the latitude from the altitude of a heavenly body when on the meridian, only its declination (or distance from the equinoctial measured on the meridian) and its angular distance from the zenith of the observer (the complement of its altitude) being required. Observations of the sun's altitude at apparent noon, or of a star's altitude at its meridian passage, give the latitude with the greatest facility.

As the altitude of the pole of the heavens above the horizon at any place is exactly the same as the latitude, the close approximation of the north star to the pole affords an excellent method of determining the latitude at any time when it and the horizon are visible, and tables have been computed affording the exact correction to be applied to its altitude for latitude determinations. To insure a greater degree of accuracy than can be obtained by one observation when exactly on the meridian, a number of altitudes may be observed when the body is near the meridian, taking, if practicable, an equal number before and after its meridian passage, and noting the time of each. These are called circum-meridian altitudes. The determination of latitude by the meridian alti-

tude of the moon is slightly more complicated and uncertain. The method of determining the latitude by two altitudes of the sun, moon, or stars, or by simultaneous altitudes of two bodies, though formerly much practiced has been almost entirely superseded by the practice of Sumner's method, which will be mentioned hereafter, and by which both latitude and longitude are determined at the same time with great accuracy.

As it is frequently the case that just at noon the sun is obscured, preventing the navigator from measuring its altitude when on the meridian, a most valuable method has been devised by which an altitude measured near noon can, within certain limits, when the time at the ship is approximately known, be used with great success for determining the latitude, and by careful navigators is very generally used, even in perfectly clear weather, as a check on the meridian observation.

The problem of finding the longitude at sea was formerly a very difficult one for navigators, and many ingenious devices have been practiced for its solution.

In 1700, Dr. Halley published a chart on which lines of equal magnetic variation were laid down, and it was proposed to ascertain the longitude by comparing the observed variation at the ship with the data on this chart; but the fallacy of the method was soon shown. A reward of £10,000 was for many years offered by the English government to any one who would devise an efficient method of determining the longitude at sea with accuracy, and this reward was finally divided between Mr. Harrison, who first made trustworthy chronometers, and Dr. Nevil Maskelyne, whose tables made the method of lunar distances practicable. The latter method is now, however, seldom used, the increased accuracy and decreased cost of chronometers having made their use almost universal.

Observations of eclipses, of occultations of the satellites of Jupiter and of stars by the moon, although of great value on shore, cannot be accurately made at sea on account of the ship's constant motion.

The determination of longitudes at sea by chronometer being effected by comparing the time at the ship with the time of the prime meridian as shown by the chronometer, it is necessary for the navigator before sailing to inform himself of the exact error of his chronometer on the time of the prime meridian, and of its daily rate gaining or losing. The determination of the time at the ship then becomes of the first importance. In consequence of the perpetual apparent revolution of the heavenly bodies, the exact measure of time is afforded by the observed hour-angle of a celestial object; that is, the angle at the pole contained between the meridian of the place and the celestial meridian passing through that body.

At sea, where the only fixed object to which the positions of the heavenly bodies can be referred is the horizon, the measurement of the altitude affords a ready and accurate method of determining the hour-angle. The hour-angle of the sun, reckoning westward from the meridian, is *apparent time*, which, by applying the equation of time from the Nautical Almanac, gives the desired mean time.

Mean time is determined from the hour-angle of a star or planet by allowing for the difference between the right ascension of the body observed and that of the sun.

Government vessels and many mail-steamers now almost universally carry three chronometers to guard against an accidental error.

The lunar method of finding the longitude at sea consists in an exact measurement of the moon's distance from the sun or from one of certain planets and stars, and a simultaneous determination of the local time.

This method was first proposed by John Werner, of Nuremberg, as early as 1514; but the theory of the lunar motion was for a long time after too imperfect to permit its practical application. The distance of the moon from the sun, from Jupiter, Saturn, Venus, and Mars, and from certain fixed stars, is given in the Nautical Almánac for every third hour of Greenwich mean time.

A measurement with a sextant or reflecting circle of the angle between the moon and any one of these bodies gives the apparent distance, to which various corrections are applied to obtain the *true distance*. From the Nautical Almanac by interpolation is found the Greenwich time corresponding exactly to this true distance, and by comparison with the time at the ship the longitude is deduced. Simple as this problem may appear, its rigorous computation is by no means brief, and, in spite of all precautions, the longitude thus obtained is liable to serious error, as the moon's motion among the stars being nearly thirty times slower than the rotation of the earth on its axis, any error in the observed distance will be multiplied by a factor nearly equal to thirty in the resulting longitude.

For this reason this method of obtaining the longitude is seldom practiced at present, except when trustworthy chronometers are not procurable.

As the latitude enters into the computation of the hour-angle, if the latitude is uncertain the longitude by chronometer is also uncertain to a greater or less degree; but if the Greenwich time by chronometer be trustworthy, the ship's position may be accurately determined by a process generally known as Sumner's method. This process is founded on the principle that the ship is somewhere on a constantly changing *curve of equal altitudes*, which may be defined as an arc of a circle joining points in different latitudes, where the sun or other heavenly body in question has the same altitude. If, therefore, two latitudes be assumed, one 10′ greater and the other 10′ less than that calculated for the ship, and the corresponding longitudes be ascertained, the ship's position will certainly (if her computed latitude be not in error more than 10′) be somewhere on a line drawn on the chart joining these two positions, as the small portion of the curve of equal altitudes between two points so close together would be almost exactly represented by a straight line. A second observation of the same or of a different body gives a second line of equal altitudes, and their intersection corrected for the run of the ship between the observations gives the position. When only one set of observations can be obtained giving one line, if this line is parallel to the shore the ship's distance from the shore is de-

termined, or if the line being produced passes through a point of land, the bearing of the point is known; and this information, combined with that derived from sounding, frequently serves to fix exactly the ship's position. The various cases in which Sumner's method may be utilized have been very fully elaborated by Lieut. de Magnac, of the French navy, in "La Nouvelle Navigation," by a recent writer in the "Nautical Magazine," and by Sir William Thomson, who has computed and published tables to facilitate the use of this method.

In addition to the instruments and books already mentioned, charts of the regions to be visited, with sailing directions and meteorological charts, are necessary to the navigator. The sailing directions contain accounts of the winds and currents for certain coasts and seas, with descriptions of the coasts and anchorages. From the various works of this kind information with regard to all the coasts of the world may be obtained, including the physical aspect of the shores, climate, and natural phenomena, as well as accounts of the manners and customs of the inhabitants, the productions, and articles of merchandise. The meteorological charts give information for each month in the year of the probable winds, weather, and currents the navigator will encounter, assisting him to direct his course to the best advantage.

From the position of the ship to the port of destination the shortest distance is on the arc of a great circle; *i.e.*, a circle the plane of which passes through the centre of the earth.

As, however, to keep on a great circle, except in the case of the equator or a meridian, a ship must constantly keep changing her course, great-circle sailing is practiced only when an appreciable distance may be saved without any corresponding disadvantage. Steamers between Europe and America almost invariably follow a great-circle track, and all telegraph-cables where practicable are laid on the arc of a great circle. On a Mercator chart a great-circle track is represented by a curve, but charts have been made on such a projection that a great-circle arc is shown by a straight line. The computation of the course and distance between two points on a great-circle arc is slightly more complicated than by Mercator's or middle-latitude sailing, and various devices have been invented to facilitate it; among the best of which are Prof. Chauvenet's Great-Circle Protractor, Mr. G. Herrle's Gnomonic Chart, Godfrey's Diagram and Tables, Towson's Index and Tables, etc.

When the distance to be saved by the practice of great-circle sailing is of no special importance, or when it is impracticable from other reasons, the straight course to be followed may be exactly computed by Mercator's sailing, or it may be shown on the chart by laying a ruler along the line joining the ports of departure and destination. The angle between this line and the meridians will be the true course to which the variation of the magnetic needle and its local deviation must be applied to determine the course to be steered. (See COMPASS.) For a more detailed account of the methods in use in navigation, the reader is referred to the "American Practical Navigator," by Dr. Bowditch; Professor Coffin's "Treatise on Navigation"; Lieut. Raper's "Practice of Navigation"; Harbord's "Glossary of Navigation," Professor Chauvenet's "Lunar Distances and Equal Altitudes," etc.—*Francis M. Green, Lieutenant-Commander U.S.N.*

Navigation Laws. The laws determining the national character of ships. See INTERNATIONAL LAW—4 (*b*).

Navigator. The officer or person to whom is intrusted the navigation of the vessel.

In the navies of the world the duties of this important position are performed by different officers. In some there is a special corps for it, in others one of the *line* or *executive* officers is detailed for the purpose.

In the merchant marine usually the commanding officer navigates the vessel; but sometimes the work is done by the first mate, under the supervision of the commander.

In the United States navy, formerly the junior line-officer of a man-of-war was by the regulations the navigator, under the title of the "master" of the vessel, and the title "sailing-master" was synonymous with that of navigator. Now the line-officer third in rank is the navigator, though for sufficient cause the proper authority may detail some other line-officer to do the duty, but this case rarely occurs.

The navigator's duties consist in shaping the vessel's course from port to port across the oceans and seas; finding her position at sea from time to time by observations of the celestial bodies and by dead-reckoning; piloting the vessel into port to her anchorage, and out again to sea, when pilots cannot be had; surveying, etc., when called upon, or in places where it is necessary from the meagre hydrographic information of the locality.

The navigator has charge of all the instruments, charts, and books pertaining to the navigation of the vessel, exercises a supervision over the anchors and cables, sees that they are properly secured at all times, that the cables are distinctly marked, and that all necessary arrangements are made for getting under way, anchoring, mooring and unmooring, slipping or shifting parts of a cable, and that the shackle-pins can be removed easily.

He has charge of the steering-gear, and sees that it is at all times in proper condition.

He must examine frequently the compasses, time-glasses, log- and lead-lines, and see that they are in proper order.

He has charge of the stowing of the hold, ballast, water, provisions, etc., and must place in the log-book plans specifying the quantity and arrangement of the ballast, the number, size, and disposition of the water-tanks, and the quantity and stowage of provisions and other stores.

He must inspect the hold, cable-tiers, chain-lockers daily, and see that they are kept clear and in good order, reporting to the executive-officer at 9.30 A.M.

He has charge of the time of the vessel, and must determine the error and rate of the chronometers before going to sea, and at all practicable places during the cruise.

He must make frequent observations for determining the local deviation of the ship's compasses on all courses, tabulating the results for use in shaping the vessel's course, and place a copy of the result in the log-book.

He must make tidal observations at all places visited where careful observations have not been made.

He must keep a book in which all calculations connected with the navigation of the vessel are made; no erasures are allowed, but the book must be a complete record of all observations, computations, and results, with their date. At the end of the cruise the book is to be sent to the Bureau of Navigation.

He has charge of the ship's log-book, commencing it when the vessel is put into commission, sees that all particulars are duly entered according to prescribed forms, that the watch-officers sign their remarks daily, and takes it to the commanding officer for his inspection at noon each day. He sends a certified copy to the commanding officer for transmission to the Bureau of Navigation every six months. See LOG-BOOK.

At sea he ascertains and reports daily to the commanding officer the position of the vessel at 8 A.M., at meridian, and at 8 P.M., and makes daily observations for the variation of the compass, when the weather permits, with such other determinations as the commanding officer may direct.

In every port he must determine the variation of the compass free from local deviation.

When there are three, or less than three watch-officers on duty, he will be required to keep a night-watch.

He is also ordnance-officer of the vessel, and in action or battle handles the ship under direction of the commanding officer.—*J. E. Noël, Lieutenant-Commander U.S.N.*

Navvies. The vigorous laborers employed in cutting canals, railroads, or river works in temporary gangs.

Navy. The armed force of a nation operating at sea or on coast and harbor defense.

NAVY OF THE UNITED STATES (1775 TO 1812).—The navy came into existence soon after the Declaration of Independence, and was based upon the laws of Congress preceding and following that declaration.

Descendants of a warlike nation, whose security on land and supremacy at sea were manifestly due to her naval power, it was natural that the wisdom of the leading statesmen should have turned their thoughts in this direction.

The country was rich in her forests, which afford a variety of timber suitable for ship-building, and was not entirely destitute of mechanics and artisans, but was compelled to rely almost entirely upon a foreign market for ordnance, ammunition, sails, rigging, etc., for an outfit suitable for cruisers before passing into the hands of the officers and crew who were finally to man and control them.

As early as October 13, 1775, an act of Congress authorized the building of one vessel of 10 guns and another of 14 guns, to be equipped as national cruisers. At the same time a law was passed establishing a *marine committee*, consisting of Messrs. John Adams, John Langdon, and Silas Deane, the place of Mr. Adams being afterwards supplied by Mr. Gadsden.

This committee, subsequently enlarged to 13, was chosen by Congress from its own body and given control of all naval matters.

October 29, a resolution was passed forbidding privateers and merchantmen wearing pennants in the presence of Continental ships or vessels of war without the permission of the commanding officers of the latter. The following day another law was passed authorizing the fitting out of two more cruisers, one to be armed with 20 guns, the other with 36 guns; and following this (December 13), the construction of 13 vessels, 3 of which were to be armed with 24 guns each, 5 with 28 guns, and 5 with 32 guns, was authorized. In the mean time the immediate wants of the service were supplied by purchasing and equipping such vessels as could be procured in open market.

These vessels constituted the first naval force of the country. They were as follows:

Ship "Alfred," 24 guns.
" "Columbus," 24 guns.
Brig "Lexington," 16 guns.
" "Cabot," 16 guns.
" "Reprisal," 16 guns.
" "Andrea Doria," 14 guns.
" "Hampden," 14 guns.
" "Providence," 12 guns.
Schooner "Wasp," 8 guns.
" "Fly," 8 guns.
Sloop "Hornet," 10 guns.
" "Independence," 10 guns.
" "Sachem," 10 guns.
" "Mosquito," 4 guns.

In this hastily improvised force were represented the various types of vessels carrying their battery on one deck, with which were fought the first battles of the Revolutionary war. They were ordered to cruise on the coast and intercept transports laden with munitions of war intended for the English army or navy.

To officer, man, and equip this little fleet from the raw material of the country, and in the absence of educated and trained officers, of arsenals, store-houses, and dock-yard facilities, was a labor perhaps little less than that encountered by the sailor King Alfred, 1000 years previous, in fitting out the fleet that he personally commanded against the Danes.

There was no lack of patriotism and activity in this transition period of the country; but there was necessarily a want of order and system, which experience and time alone could supply.

The act of Congress, December 22, appointed the following officers:

Ezekiel Hopkins, commander-in-chief.
Dudley Saltonstall, captain of his flag-ship "Alfred."
Abraham Whipple, captain "Columbus."
Nicholas Biddle, captain "Andrea Doria."
J. B. Hopkins, captain "Cabot."

First Lieutenants.

John Paul Jones,* "Alfred."
Rhodes Arnold, "Columbus."
—— Stansbury, "Andrea Doria."
Hoysted Hacker, "Cabot."
Jonathan Pitcher, "Hornet."

Second Lieutenants.

Benjamin Seabury, "Alfred."
Joseph Olney, "Columbus."
Elisha Warner, "Andrea Doria."
Thomas Weaver, "Cabot."
—— McDougal, "Alfred."

* Claims to have first hoisted the American flag (pine-tree and rattlesnake) on board of the "Alfred," lying in the Delaware River, December, 1775, upon the occasion of Commodore Hopkins's visit to her.

Third Lieutenants.

John Fanning, "Columbus."

Ezekiel Burroughs, "Andrea Doria."

Daniel Vaughn, "Cabot."

The "Alfred," "Columbus," "Cabot," "Andrea Doria," "Providence," "Wasp," "Fly," and "Hornet" composed the squadron of Commodore Hopkins, that put to sea February 17, 1776, bound to the West Indies. On the second night out the "Hornet" and "Fly" parted company, and did not rejoin during the cruise. The remainder of the squadron finally made a descent upon New Providence, capturing some military stores, including nearly 100 cannon, which were much needed at this period in arming cruisers.

Leaving here March 17, and taking with him the governor and a few other persons of note, Hopkins returned North, and off Long Island fell in with and captured an English bomb-brig of 8 guns, a tender of 6 guns, and had a running fight of several hours with H. B. M. ship "Glasgow," of 20 guns, which made a very creditable defense, and finally escaped by good management. Early in April the squadron arrived in New London, and in October following Congress passed a vote of censure upon the commanding officer for not performing the duties upon which he had been sent, and he was dropped from the service in the following year, January 2.

Thus ended the title of "Commander-in-Chief of the Navy," except as applied to the President, as the commander-in-chief of both army and navy.

March 23, letters of marque and reprisal were issued by the Continental authorities of the United States against Great Britain, and on February 7 following, retaliatory edicts were issued by the latter.

June 25, a marine corps, consisting of a major (Samuel Nichols), 9 captains, 10 first and 7 second lieutenants, was appointed.

See, also, acts of January 8, 1780, and July, 1798.

Following the Declaration of Independence, July 4, 1776, was an effort to equip the fleet already ordered, and the following officers were assigned to their respective vessels in the order of rank:

James Nicholson, to command the "Virginia," 28 guns.

John Manley, to command the "Hancock," 32 guns.

Hector McNiel, to command the "Boston," 24 guns.

Dudley Saltonstall, to command the "Trumbull," 28 guns.

Nicholas Biddle, to command the "Randolph," 32 guns.*

Thomas Thompson, to command the "Raleigh," 32 guns.

John Barry, to command the "Effingham," 28 guns.

Thomas Reed, to command the "Washington," 32 guns.

Thomas Grennall, to command the "Congress," 28 guns.

Chas. Alexander, to command the "Delaware," 24 guns.

Lambert Wickes, to command the "Reprisal," 16 guns.†

Abraham Whipple, to command the "Providence" (2d), 28 guns.

John B. Hopkins, to command the "Warren," 32 guns.

John Hodge, to command the "Montgomery," 24 guns.

William Hallock, to command the "Lexington," 16 guns.

Hoysted Hacker, to command the "Hampden," 14 guns.

Isaiah Robinson, to command the "Andrea Doria," 14 guns.‡

John Paul Jones, to command the "Providence," 12 guns.

James Josiah, to command the "Camden" (galley).

Elisha Hindman, to command the "Alfred," 24 guns.

Joseph Olney, to command the "Cabot," 14 guns.

James Robinson, to command the "Sachem," 10 guns.

John Young, to command the "Independence," 10 guns.

Elisha Warner, to command the "Fly," 8 guns.

November 9, a law was passed authorizing the building of the first line-of-battle ship of 74 guns; her keel was laid at Portsmouth, N. H., where she was completed in 1781, and named the "America"; her armament was reduced to 56 guns, and in the following year she was presented by the government to Louis XVI. of France to replace the "Magnifique," 74, lost in Boston harbor.

The same month, a Continental Navy Board, consisting of three persons, was appointed subordinate to the Marine Committee. These were John Nixon, John Wharton, and F. Hopkinson, who were supposed to be skilled in maritime affairs; they were given a salary of $1500 each per annum, and were empowered to regulate the rank of lieutenants and subordinate officers.

November 15, 1776, Congress apparently contemplating higher grades of rank in the navy, established the following relative rank between the navy and army officers:

Admiral, with general.

Vice-Admiral, with lieutenant-general.

Rear-Admiral, with major-general.

Commodore, with brigadier-general.

Captain of a 40-gun ship and upwards, with colonel.

Captain of a 20- to 40-gun ship, with lieutenant-colonel.

Captain of a 10- to 20-gun ship, with major.

Lieutenant, with captain.

And officers of marines with similar commissions in the land service.

The first four naval grades above were only created by law in 1862, although in the official correspondence of the State Department the title of admiral was conceded to John Paul Jones just previous to his death, in 1792, and his commission may have been so worded, though I find no law

* Was completely dismasted on the coast in a gale, in 1779. Subsequently lost a mast by a stroke of lightning, and was finally blown up at sea, March 7, 1778, during an action with H. B. M. ship "Yarmouth," 64 guns, and all but 4 out of 315 souls perished.

† The first American vessel of war that visited European waters, where she took several prizes this year, and being joined by the "Lexington" and "Dolphin" in the following year, cruised in English waters, making captures and causing a sensation that raised the rates of insurance 25 per cent. In 1778 foundered at sea, and all but the *cook* lost.

‡ Received the first foreign salute, which cost the Dutch governor of St. Eustatia his commission.

creating the title. The subordinate grades of master, surgeon, purser, chaplain, midshipman, boatswain, gunner, carpenter, and sailmaker, came early into existence with prescribed duties, pay, and responsibilities corresponding very much to those of the English service, from which the navy very naturally copied.

The same is true in regard to naval laws, regulations, and customs, as well as naval construction, armament, etc., which have since undergone many changes. Vessels at this period were poorly armed and hastily put together; often built of green timber, which decayed in a few years.*

By those familiar with the early history of the country it will be noticed that several very spirited conflicts of a nautical character took place that have been passed over, for the reason that they were not purely naval. One of these was fought by Capt. Broughton, of Marblehead, who, upon the authority of the biographer of Gen. Washington (Mr. Sparks), was the first officer commissioned by him in the navy.

It would be difficult at this day to name or properly locate all of the early appointments that were made. Some had but a brief existence, and changes were frequent.

Limited appointments were conferred abroad by the minister to France, Dr. Franklin, who was also authorized to purchase or accept the loan of vessels from foreign subjects. Among these were the "Duras," "Pallas," "Cerf," and "Vengeance," which, with the "Alliance," composed the little squadron that cruised in English waters under Commodore J. P. Jones in 1779, making many captures. While in command of the former (her name being changed to the "Bon Homme Richard") he engaged H. B. M. ship "Serapis," Capt. Pearson, September 23, in the British Channel, and captured her after one of the most obstinate naval duels on record. The ships were nearly equally armed and manned, and each lost about one-half of her crew in killed or wounded; the former sank two days after the action.

October 28, 1779, naval administration was intrusted to a Board of Admiralty consisting of five persons, three of whom were Congressmen, and these were given control of all naval and marine affairs. April 20, 1780, this board drafted the commission which in substance is the same as that now issued to all officers entitled to a commission.†

February 7, 1781, Secretaries of War, Finance, and Marine were appointed. The latter office was conferred upon Brig.-Gen. Alex. McDougall, who had been a seaman in his early manhood, with all the powers and duties previously confided to the Board of Admiralty, and in the following August an Agent of Marine was appointed to supersede all agents, boards, or committees previously established by law. The duties of this office subsequently devolved upon the celebrated Robert Morris, who was the Secretary of Finance until November, 1784.‡

For some reason there appears to have been much difficulty in finding the right man to place at the head of the navy, and these frequent changes operated unfavorably to the service in many ways. The war of the Revolution had witnessed many gallant encounters and the capture of some 800 prizes. Nevertheless, the navy had suffered severely, losing by capture 11 vessels of war, besides the little fleet of gunboats on Lake Champlain; so that, including 13 others destroyed to prevent their falling into the hands of the enemy, with 3 foundered at sea and 5 condemned or sold, the country was virtually without a navy from 1780 to 1785. A treaty of peace, however, had been concluded with Great Britain as early as September 23, 1783.

Taking advantage of this lull, commerce increased, and ventured into the Mediterranean, where in its defenseless condition it soon became a prey to the cruisers of the Barbary powers. This revived the naval problem, and demonstrated to the country not only the necessity of providing a navy capable of protecting our commerce abroad, but that it should be placed upon a more permanent basis at home, by constructing docks, arsenals, etc., and by building ships under the supervision of experienced naval officers.

August 7, 1789, the Secretary of War was given control of naval affairs.

It was during this and the following year that the American ship "Columbus" and sloop "Washington" circumnavigated the globe,—the first American vessels it is believed that accomplished this feat.

Efforts at negotiation with the Barbary powers failed; up to 1793 13 vessels had been captured by the Algerine corsairs, and their officers and crews, to the number of 119, had been confined as prisoners, when President Washington recommended the building of 6 frigates, which recommendation a subsequent act of Congress, March 27, 1794, adopted, prescribing that 4 of them should be armed with 44 guns each, and 2 with 36 guns.

Other sections of the law prescribed the number of officers and men of each grade, including pay and rations, that should make up the complement of each class of vessels. Naval constructors and agents were also appointed.

It is worthy of record that at this early date an act prohibiting the slave-trade was passed.

A treaty of peace with Morocco, Algiers, and Tripoli following in 1796, the number of frigates previously authorized was reduced one-half. In the discussion that arose in Congress in regard to this reduction, the President strongly urged a gradual increase of the navy, remarking that "it is our own experience that the most sincere neutrality is not a sufficient guard against the depredations of nations at war," that "the protection of a naval force is indispensable to an active, external commerce," and that "to secure respect to a neutral flag requires a naval force organized and ready to vindicate it from insult or aggression."

1797.—The frigate "Constitution," 44 guns, was launched at Boston; the "United States," 44 guns, at Philadelphia; and the "Constella-

* June 14, 1777, it was "Resolved, That the flag of the thirteen United States be 13 stripes, alternate red and white; that the union be 13 stars, white, in a blue field, representing a new constellation."

† The "Saratoga," 16 guns, Capt. J. Young, was lost at sea this year and never after heard from.

‡ August 5, 1783, he reports "that it is an object highly desirable to establish a respectable marine, yet the situation of the public treasury renders it not advisable to purchase ships for the present, nor until the several States shall grant such funds for the construction of ships, docks, and naval arsenals, and for the support of the naval service as shall enable the United States to establish their marine upon a permanent and respectable footing."

tion," 36 guns, at Baltimore. Each of these ships has won an enviable reputation in the navy. The first and last still belong to the service. Their timbers have of course been often renewed, as the life of a ship seldom exceeds 15 years; but their name and fame will outlast the material of which they are constructed.

They were beautiful models of their time, with strength and stability, carrying capacity, sailing and manœuvring qualities, that modern types have not always improved upon. They were modeled by Naval Constructor Samuel Humphries, and built under the superintendence of Commodores Samuel Nicholson, John Barry, and Thomas Truxtun. The first two had a length of 175 feet, beam 43½ feet, and depth of hold 14¼ feet, with a tonnage of 1607, old measurement. The latter was: length, 161 feet; beam, 40 feet; depth of hold, 13½ feet; and tonnage, 1278. Their batteries frequently underwent change conformably to the continual changes in ordnance.

April 30, 1798, the Navy Department was established, and Benjamin Stoddart became the first Secretary of the Navy, with a salary of $3000 per annum. The marine corps was re-established, and there were added to the navy 11 ships, carrying from 18 to 24 guns, and as many smaller vessels, carrying from 10 to 18 guns each.

The *personnel* available for this reorganized navy was 28 captains, 7 master-commandants, and a proportionate number of lieutenants and other subordinate officers.

Among the lieutenants was Charles Stewart, who alone lived to be promoted to the rank of admiral, and was probably the only survivor in 1862.

To our republican form of government, our growing and competing commerce, our weakness as a naval power, or to all combined, may perhaps be attributed a certain unfriendly spirit on the part of European powers,—especially manifested in the changed relations of France, and the wanton attacks of her cruisers upon the commerce of the country,—until forbearance ceasing to be a virtue, the acts of May 28 and July 9 authorized the President to instruct the commanders of public armed vessels and privateers, duly commissioned, to make reprisals.

The Secretary of the Navy urged in his report to Congress a large increase of the navy, adding, "that it should be so augmented as to make the most *powerful* nations desire our friendship, and the most *unprincipled* respect our neutrality."*

March 2, 1799, an act was passed deducting 20 cents per month from the pay of each officer, seaman, and marine of the navy to constitute a hospital fund.

To carry out previous instructions the following squadrons were dispatched:

Windward Islands. Rendezvous, Rupert's Bay:
"United States," 44, Commodore John Barry.
"Constitution," 44, Captain Samuel Nicholson.
"George Washington," 24, Captain P. Fletcher.
"Merrimack," 24, Captain Moses Brown.
"Portsmouth," 24, Captain Danl. McNiel.
"Herald," 18, Master-Commander C. C. Russel.
"Pickering," 14, Lieut.-Commander E. Preble.
"Eagle," 18, Captain H. G. Campbell.
"Scammel," 14, Captain J. Adams.
"Diligence," 12, Captain J. Brown.

Leeward Islands. Rendezvous, St. Kitts:
"Constellation," 36, Commodore T. Truxtun.
"Richmond," 18, Captain Samuel Barron.
"Baltimore," 20, Captain Isaac Phillips.
"Norfolk," 18, Captain Thomas Williams.
"Virginia," 14, Captain Francis Bright.

To guard the passage between Cuba and San Domingo:
"Ganges," 24, Commodore Thomas Tingey.
"Gen. Pinckney," 18, Captain S. Hayward.
"South Carolina," 12, Captain J. Payne.

To cruise off Havana:
"Delaware," 20, Captain S. Decatur, Sen.
"Gen. Green," 10, Captain Geo. Price.
"Gov. Jay," 14, Captain J. W. Leonard.

The act of March 2, 1799, for the government of the navy of the United States, was followed by the act of April 3, 1800, for the *better* government of the navy of the United States, usually known as the *Articles of War*, that have since been in force, and are frequently read to the officers and crew assembled on the quarter-deck of vessels in commission.

In 1800 the seat of government was transferred to Washington, D. C.

The previous acts of Congress of May and July, 1798, amounted to a virtual declaration of war against France, and during its continuance till the close of 1800 nearly 100 prizes were captured by the squadrons previously named, and many sharp conflicts occurred between single vessels, which were generally short and decisive, and reflected credit upon the young navy.

Among these were the actions of the U. S. S. "Constellation," Commodore Truxtun, with the French frigate "L'Insurgente," in 1799, and "La Vengeance," in 1800, in which the enemy were superior in number of guns and men, and suffered a greater loss in killed and wounded. In the latter action the enemy opposed a battery of twenty-eight 18-pounder, sixteen 12-pounder, and eight 42-pounder carronades to the "Constellation's" twenty-eight 18-pounder and ten 24-pounder carronades; the latter are believed to be the first ever used in the United States service, and are only effective at very close quarters.

The "Constellation" lost her mainmast in this action, Midshipman Jarvis and all the topmen going with it. Commodore Truxtun was given a gold medal for his gallantry by an act of Congress.

The U. S. brig "Pickering," commanded by Lieut. Hillar, that sailed in August of this year on a cruise to the West Indies, was never more heard from.

* The committee in Congress appointed to take this matter into consideration sustained and amplified the Secretary's recommendations.

Then followed a lively debate, upon which the opponents of course wished to impress upon their constituency, if not the country, that they were in favor of *economy and retrenchment*, and above all, that they were opposed to "*large military and naval organizations as dangerous to the liberties of the people*"! A very ancient weapon, but fortunately having no application to either the army or the navy so far as its present history. The contest finally ended in giving discretionary power to the Secretary to erect a dock, to increase the number of men and guns in certain vessels, and to have built 6 line-of-battle ships, none of which were launched until after the war with Great Britain.

The theory of the English government, that their subjects wherever found owed their first allegiance to the crown, was exemplified this year in the seizure of 5 men on board of the U. S. S. "Baltimore," Capt. Phillips, off Havana, by the British squadron under Commodore Loring, resulting in the dismission of the former and instructions from President Adams, through the Secretary of the Navy, to the commanders of all United States vessels of war to resist to their utmost any future insult of detention, search, or seizure, and when no longer able to resist, to surrender the vessel, but not the men without the vessel.

The whole expense of the navy up to this period, including the purchase of six sites for navy-yards, was estimated at about $10,000,000, while the annual exports had increased to $93,-000,000, and the revenue to $10,000,000.

February 3, 1801, a treaty of peace was ratified with France, and Capt. C. C. Russel was dispatched with the "Herald" to recall the squadrons in the West Indies.

By the act of March 3, the navy was reduced to a peace-footing by the sale of all the remaining vessels, excepting the frigates "Constitution," "Adams," "General Green," "Constellation," "J. Adams," "New York," "Congress," "Boston," "President," "Chesapeake," "Essex," "Philadelphia," and the schooner "Enterprise." Those sold were first divested of their armaments and stores, and brought less than it would now cost to build a first-class frigate.

Their services, however, in protecting commerce and maintaining the honor of the country cannot well be estimated.

Unfortunately, this reduction of the navy occurred at a period when the bashaw of Tripoli was threatening to dispatch his cruisers to prey upon the commerce of the country unless presents were immediately sent him, adding that he had always exacted this from the English, French, and Spaniards.

The bey of Tunis made demands no less importunate, saying that Denmark, Spain, Sicily, and Sweden had made concessions to him, and that if the President did not send him without delay forty cannon of *different calibres* (adding that he wished them all to be 24-*pounders*), besides 10,000 stand of arms, peace would be no longer possible.

The dey of Algiers, to whom the government presented the frigate "Crescent" in 1798, was also becoming inconsolable again.

The government therefore wisely concluded that an exhibition of force instead of presents would better meet the occasion.

Commodore Dale was dispatched January 1, 1801, with a small squadron to the Mediterranean, with full instructions from Secretary S. Smith to meet all demands, and, if necessary, to punish these insolent people. "Millions for *defense* but not *one cent* for *tribute*" had become the watch-word.

This squadron consisted of the frigate "President," 44, flag-ship, Capt. Jas. Barron; frigate "Philadelphia," 36, Capt. Sam. Barron; frigate "Essex," 32, Capt. Wm. Bainbridge; schooner "Enterprise," 12, Lieut. Sterrett.

The commodore reached Gibraltar in July, where he found at anchor a Tripolitan ship of 26 guns and a brig of 16 guns, which looked suspicious; but the officers declared that they were not at war with the United States, and the contrary did not fully appear until their arrival at Malta.

Lieut. Sterrett, in the "Enterprise," had in the mean time, August 1, fallen in with and captured a Tripolitan corsair of 14 guns, her commander, Mahomet Sous, making an obstinate resistance, and being rewarded on his return to Tripoli in his disarmed vessel, used as a cartel, by a public "bastinado." Lieut. Sterrett, for his gallant conduct on this occasion, was rewarded by the presentation of a sword by Congress.

President Jefferson, in alluding to this duel in his message to Congress, remarked that "the measure was seasonable and salutary; . . . the bravery exhibited by our citizens will, I trust, be a testimony to the world that it is not a want of that virtue which makes us seek their peace."

The bashaw of Tripoli still declining all friendly overtures, and refusing to surrender American prisoners in his possession, Congress enacted laws that were equivalent to a declaration of war as early as February 6, 1802, and a squadron was sent out to relieve Commodore Dale. This squadron was under the command of Commodore R. V. Morris, and consisted of the following vessels:

"Chesapeake," 38, flag-ship, Lieut. Chauncey.
"Constellation," 36, Capt. A. Murray.
"New York," 36, Capt. Jas. Barron.
"Adams," 32, Capt. H. G. Campbell.
"John Adams," 32, Capt. John Rodgers.
"Enterprise," 12, Lieut. A. Sterrett.

Commodore Truxtun had been selected for this squadron, but declined on a question of a flag-captain.

The crews were shipped for two years instead of one, as heretofore. The ships were well officered and manned; but the guns were mostly ill suited to long-range bombardment.

Commodore Morris was also authorized to detain the U. S. S. "Boston," Capt. McNiel, then in the Mediterranean; also to purchase from the European powers some small gunboats, to protect commerce in the Strait of Gibraltar and assist in blockade duty.

The vessels sailed as they were ready, and arrived out at different periods between May and September. The "Chesapeake" sprung her mainmast and the "Constellation" her foremast on their way out. The latter was the first frigate to reach Tripoli, and the first to open hostilities by an attack upon some gunboats that were driven on shore near Tripoli.

The commodore reached Gibraltar May 25, where he found Capt. Bainbridge in the "Essex" blockading a Tripolitan ship of 22 guns. Malta was the port appointed as a rendezvous, where the squadron finally assembled.

The year passed without anything especial being accomplished, and Commodore Morris was subsequently censured for this.

1803.—Early this year the squadron visited the Barbary powers that were evidently in collusion with each other and meditating mischief.

Commodore Morris transferred his flag to the "New York," and sent the "Chesapeake" home under Capt. J. Barron. Being recalled in June, he returned home in the "Adams"; he was censured by a court of inquiry, and in the following year was dismissed from the service by the President. This left the squadron in command of Commodore J. Rodgers, who was in turn relieved by Commodore Ed. Preble, at Gibraltar, September 12, 1803, having previously destroyed the "Meshouda," of 22 guns, when attempting to evade the blockade off Tripoli,* June 21.

Commodore Preble's squadron consisted of his flag-ship "Constitution," 44 guns; ship "Philadelphia," 36 guns, Capt. W. Bainbridge; brig

* This vessel, originally Tripolitan, then belonged to the emperor of Morocco, and is the same one previously mentioned as blockaded at Gibraltar.

"Siren,"* 16 guns, Lieut. C. Stewart; schooner "Vixen,"* 14 guns, Lieut. J. Smith; schooner "Nautilus,"* 12 guns, Lieut. R. Somers; brig "Argus,"* 16 guns, Lieut. I. Hull; schooner "Enterprise," 12 guns, Lieut. S. Decatur, already in the Mediterranean.

As in the case of the previous squadron, the vessels left the United States singly as their outfits were completed, and had an average passage of 35 days to Gibraltar.

August 26, the "Philadelphia" being off Cape de Gatt, fell in with and captured the armed ship "Meshboha," of 22 guns, belonging to Morocco, having in company the American brig "Celia" as a prize. The officers confessed they were ordered by the governor of Tangier to capture American vessels; and this necessitated a visit of the squadron to Tangier, where the emperor of Morocco expressed his regrets that any hostile acts had been committed, declared that he would punish the authors, and would release all vessels previously captured under the orders of his governors; and further, that he would ratify the treaty made by his father in 1786, adding "that his friendship for America should last forever." Friendly salutes were exchanged, and Commodore Rodgers sailed for the United States. Commodore Preble sailed up the Mediterranean, after touching at Cadiz and Gibraltar, and reached Malta on the 27th of November, where he received a confirmation of the report of the loss of the U. S. S. "Philadelphia," Capt. Bainbridge, off Tripoli, Oct. 31, 1803, having run upon a rock while endeavoring to intercept the enemy's vessels near the land. The officers and crew of the "Philadelphia," numbering 307 souls, became prisoners, and were retained as such during the war. This unfortunate accident increased the pretensions of the enemy, and rendered peace negotiations more difficult. A subsequent decision of a court of inquiry held at Syracuse exonerated Capt. Bainbridge from all blame for the loss of his ship. The sailor of the present day, with the advantages of steam and reliable charts, would not have fared so well.

Previous to surrendering the ship, Capt. Bainbridge had, while under the fire of the enemy's gunboats, made every effort to extricate her by cutting away the foremast, throwing overboard guns, etc. The enemy, with the aid of their gunboats and the high tides, were more successful a few days after, not only floating the vessel into their harbor, but weighing and remounting her guns, thus affording a temptation for her destruction, which was not long deferred. December 23, Lieut. Decatur, in the "Enterprise," captured the ketch "Mastico," loaded with female slaves, and bound to Constantinople as a present to the Porte. This vessel was taken into the service under the name of the "Intrepid," and armed with 4 guns. The cargo was of course released.

February 3, 1804, having been prepared with a view of destroying the "Philadelphia," she was placed in charge of Lieut. S. Decatur, and dispatched from Syracuse by Commodore Preble, with a crew, including officers, numbering 75 souls, all volunteers, and under the escort of Lieut. Charles Stewart in the "Siren." February 9, Tripoli was sighted, but owing to gales and stormy weather a favorable opportunity did not offer until the night of the 16th, when, favored by the darkness, Lieut. Decatur laid his vessel alongside of the "Philadelphia," drove the Turks overboard, set fire to the ship, and in less than half an hour was sweeping the "Intrepid" out of the harbor under the fire of the batteries, 2 corsairs, and 1 galley, which was returned by the guns of the "Philadelphia" as the fire progressed and the guns became heated.

As this has been regarded as one of the best planned and most successful and gallant feats of this war, I here add the names of the officers who volunteered and took part in it: Lieut. Commandant S. Decatur, in the "Intrepid"; Lieuts. J. Lawrence, J. Bainbridge, J. Thorn; Surgeon Heerman; Midshipmen C. Morris, T. McDonough, R. Isard, A. Laws, J. Davis, J. Rowe, T. O. Anderson; Pilot Salvador Catalano. All of these officers were promoted.

During March, Lieut. Stewart, in the "Siren," captured the brig "Transfer," of 16 guns and 80 men, while attempting to run the blockade. She had an English commission. Was taken into the service, and named the "Scourge."

Commodore Preble, who had made his headquarters at Syracuse, was in the mean time preparing his squadron for more serious work. Leaving here July 14, in the "Constitution," with 8 brigs, 3 schooners, 6 gunboats, and 2 bomb-vessels, he touched at Malta, and appeared off Tripoli on the 25th. Here he found opposed to him batteries mounting 115 cannon of various calibre, 19 gunboats, 1 brig of 10 guns, 2 schooners of 8 guns each, and 2 galleys, all moored in front of the town.

The *first attack*, August 3, was made by all the squadron, the "Constitution" covering the smaller vessels and occasionally delivering a broadside at the batteries, which could only be reached by the thirty long 24-pounders mounted on her gun-deck, and six 26-pounders mounted on the spar-deck, if the shells thrown by the mortar-vessels are excepted, and a shot from a long 24-pounder carried by each of the gunboats which was used against their immediate foe afloat. The bombardment lasted two hours, and resulted in the death of Lieut. James Decatur, and 13 wounded; the enemy had 3 of their gunboats sunk, 3 captured, and suffered more severely in killed and wounded.

The *second attack*, August 7, lasted three hours. The 3 prize gunboats, numbered 7, 8, and 9, went in under the command of Lieuts. Crane, Caldwell, and Thorn. After being engaged about one hour, No. 8 received a hot shot through her magazine and blew up, killing her commander, Lieut. Caldwell, and Midshipman Dorse and 6 men, and wounding as many more. The other vessels received more damage aloft than in their hulls. The "Constitution" remained out of this action, but maintained a signal supervision. During the evening the "John Adams," 28, Capt. Chauncey, arrived with stores and dispatches from the United States.

The *third attack*, August 24, was made by two bomb-vessels sent in to practice upon the town without drawing the enemy's fire, and it was sub-

* Built under the act of February 28, the brigs having a battery of two long 12-pounders and sixteen 24-pounder carronades; the schooners two long 9-pounders and twelve 18-pounder carronades. They were a class of vessels much needed on this service, and having survived this war, were all captured in the subsequent war with England.

sequently learned that all the shells fell short, and of those previously fired, only one burst owing to defective fuzes. This was learned from Capt. Bainbridge, who occasionally communicated with the squadron.

The *fourth attack*, August 28, was a night attack. All the small vessels, excepting the bomb-brigs, accompanied by the boats of the squadron, were sent in, and were joined by the commodore, in the "Constitution," at daylight. The rapidity and accuracy of the latter's guns created much loss and havoc among the enemy, sinking one of their gunboats and driving others ashore. A boat belonging to the "John Adams" was destroyed by a double-headed shot, and 3 of the crew killed. Nothing more serious occurred. Seven hundred shot had been fired by the flag-ship, and the enemy confessed that they had been roughly handled.

The *fifth attack*, September 3, was made by the whole squadron, and lasted for one and a half hours, the enemy judiciously changing their tactics and gradually retreating when hard pressed. The "Constitution" ran in close, and as her broadside would bear, silenced the enemy's batteries by her rapid and well-delivered fire. That she should have escaped with only slight damage aloft is due to poor gunnery on the part of the enemy. The bombards suffered more severely, but no one was killed.

Following this last squadron attack, and during the next night, the ketch "Intrepid," that had been employed in destroying the "Philadelphia," was sent in with powder and combustibles and a picked crew to destroy the shipping in port. For some cause which will never be known she blew up when near her destination, killing all on board, including her commander, Lieut. Commandant R. Somers, H. Wadsworth, J. Israel, and 10 men.

In the language of the naval historian Cooper, this "scene of sublime destruction" was really the last blow aimed at this weak and arrogant power, and was a sad winding up of a war lasting over three years on an exposed and miserable coast, in which ships, officers, and men suffered alike in wear and tear. It was, nevertheless, an excellent school for professional training, while it taught a severe lesson to the Mohammedan race, and put an end to further tribute.

A few days later, September 10, the frigate "President," Commodore Samuel Barron, and the "Constellation," Capt. H. Campbell, arrived, when the squadron was turned over to the former, and Commodore Preble left for Malta, taking with him the two prizes captured on the 12th. At this port he turned over the "Constitution" to Capt. S. Decatur, and proceeded to Syracuse in the "Argus," from thence home in the "John Adams," where, upon his arrival, he was presented with a gold medal and the thanks of Congress to himself, officers, and crew for gallant and faithful services.

In November, Capt. J. Rodgers being senior officer, was transferred to the "Constitution," and Decatur to the "Congress."

The blockade of Tripoli was still maintained, and to create a favorable diversion a combined sea and land force was dispatched, April 27, 1805, to assist the deposed bashaw, Hamet Caramalli, in an attack upon the Tripolitan town of Derne, which was bombarded by the "Argus," "Nautilus," and "Hornet" from seaward, and at the same time attacked in the rear by the land forces under Consul-General Eaton and Lieut. O. Bannon. After a spirited resistance of one hour and a half the town surrendered, and was given in charge of the deposed bashaw, whose brother was the power at Tripoli. Of the assailing force only 14 were killed, and among the wounded was Gen. Eaton.

Following this, a demonstration was made against Tunis, and so well followed up by Commodore Rodgers (who had relieved Commodore Barron, May 26) that negotiations were much facilitated, and a treaty of peace followed, June 3, when all prisoners were surrendered and it was stipulated that no more tribute should be paid.

The squadron, which had increased to 20 vessels, including the 2 bombards "Etna" and "Vesuvius," and the ship "Wasp," 18, and brig "Hornet," 18, was gradually withdrawn from the Mediterranean.

The *gunboat* policy, which originated in 1803, was this year, March 2, revived by an act authorizing the President to have 25 built for the protection of the harbors of the country. These were increased to 50 by the act of April 21, 1806, and to 188 by the act of December 18, 1807. They were numbered as they were built or purchased; and of the first 9 sent to the Mediterranean in 1805, all but No. 7, though sailing from different ports of the United States, arrived in Syracuse within 28 hours of each other. No. 7, commanded by Lieut. Ogilvie, was lost at sea. No. 2 was armed with one long 32, and the remaining 8 with two long 32's. Of the other vessels of this class but very few performed valuable service on the coast. Some were lost and others condemned. At best they were only an auxiliary force, and never in favor with the officers of the navy.

From this period on to the war with Great Britain the navy was sadly neglected, and but for the appeals of the older officers, and the increasing depredations upon the commerce of the country, it was in a fair way of being forgotten.

The nation, although slow in her resentment, was not disposed to excuse continual encroachments upon her commerce, much less to condone the insult conveyed in the act of the commander of H. B. M. ship "Leopard," in firing into the U. S. S. "Chesapeake" on the coast, June 22, 1807. In consequence of this outrage all British vessels were ordered to leave the ports of the United States. War would seem to have been the proper remedy, but the country was ill prepared for this, and negotiations continued.

The embargo laid upon vessels (December 22) this year was repealed, and a non-intercourse act passed March 4, 1809.

At the close of this year it became painfully manifest that a crisis was approaching, for which the country was unprepared. A feeble effort was made to increase the *personnel* of the navy to about 7000 officers and men, and the frigates "United States," "President," "Essex," and "John Adams" were ordered to be equipped; the last named had been razeed to a sloop-of-war. June 24, 1810, H. B. M. ship "Moselle" fired into the U. S. brig "Vixen" near the Bahamas, and May 16, 1811, Commodore Rodgers, in the frigate "President," exchanged shots with H.B.M. ship "Little Belt," killing and wounding several of her crew. This was at night, and partly

accidental, but it showed a preparation for returning compliments, and an earnest of what was soon to follow—in the declaration of war against Great Britain, June 18, 1812.

And here I will leave to another the continuation of this record, commencing with the war with Great Britain, the principal actors in which have passed away; but the history of the navy in this crisis, and during subsequent events, may well challenge the criticism of the world.—*George F. Emmons, Rear-Admiral U.S.N.*

Navy of the United States from the Commencement of the War with Great Britain in 1812 to 1880.—From the commencement of the great wars between Napoleon and England and the Continental powers of Europe, our rights as a maritime nation had been frequently violated by the principal maritime belligerents, and England, by her course of conduct, had exasperated the national sentiment to such a degree that quiet submission to her pretensions and exactions became no longer possible. The injury to our commerce through her orders in council, the impressment of our seamen upon the high seas, the arrogant and oppressive conduct of her officers in asserting the right of search, together with the discovery of a plot on the part of English agents to sever the American Union, roused the indignation of the country, and led to a declaration of war by Congress against the king of Great Britain on the 18th of June, 1812.

At the breaking out of the war the navy of Great Britain contained 1060 sail, of which between 700 and 800 were efficient cruisers, and she possessed in her West India possessions and Bermuda and Halifax ports proximate to our coast for refitting her vessels of war and places of refuge for her prizes. The naval force of the United States consisted of 17 cruising-vessels, of which 9 were of a class less than frigates, and a number of gunboats of limited size and armament for the protection of our rivers, bays, and inlets. Under this great disparity in naval strength and with a vast extent of sea-coast, every port upon which was liable to blockade, the United States was about to engage in war with a nation who possessed a navy more powerful than all the rest of Christendom combined, and which had proven its invincibility upon the ocean. Under such conditions and disparity of means it was thought impossible to keep our cruisers at sea, and a project was entertained by the Cabinet of laying up all our vessels in ordinary to prevent their capture. Fortunately, at this time Capts. Bainbridge and Stewart were at the seat of government, and through their vigorous representations and remonstrances the Cabinet was induced to change its policy. Outside of the navy even its friends looked forward to the conflict with distrust, while the English officers —many of them veterans who had served with Nelson and England's famous captains, and had seen the flag of England always triumphant— felt a degree of confidence that begets success.

Upon the declaration of war the "President," 44, Commodore Rodgers; "Essex," 32, Capt. Porter; and "Hornet," 18, Capt. Lawrence, were in New York. These vessels, with the exception of the "Essex," which vessel was fitting for sea, were ready to sail. Commodore Rodgers, with the "President" and "Hornet," dropped into the bay, where he was joined by the "United States," 44, Commodore Decatur; "Congress," 38, Capt. Smith; and "Argus," 18, Lieut. Commandant Sinclair. Within an hour of the receipt of his orders and official information of the declaration of war Commodore Rodgers was under way, passing Sandy Hook with his squadron the afternoon of June 21. On the 23d, at 6 A.M., a vessel was seen to the northward and eastward, to which chase was given, and at half-past four the "President" opened with her chase-guns. The first hostile shot afloat, it is understood, was fired by Commodore Rodgers in person. This shot struck the chase in the rudder-coat and lodged in the wardroom. Several effective shots followed, but at the fourth discharge, fired from the first division below, the gun burst, killing and wounding 16 men, the commodore being thrown by the explosion into the air and breaking a leg by the fall. The forecastle deck was damaged, and through the accident firing was delayed for some time. This enabled the enemy to open with his stern-guns, one shot killing a midshipman of the "President" and 2 men. By lightening the enemy managed to escape. It was afterward known that the vessel chased was the "Belvidere," Capt. Byron. She arrived in Halifax a few days after, and carried with her the news of the declaration of war. The "President" had 22 men killed and wounded, 16 of whom were by the bursting of the gun. The "Belvidere" lost 7 killed and wounded by shot and several others by accidents, and she was materially injured in her spars, sails, and rigging. Capt. Byron was among the wounded. The injuries to the "President" were slight. On the 9th of July the "Hornet" captured an English letter of marque. Commodore Rodgers, after continuing his cruise until within a day's sail of the chops of the English Channel, stood to the southward, and, after passing Madeira, returned to Boston. Early in July an English squadron, of which Capt. Broke, of the "Shannon," was senior officer, appeared off New York and made several captures, the "Nautilus," 14, Lieut. Commandant Crane, being one of the number. She was captured, after all the resources of an accomplished officer were exhausted, by an overwhelming force. This was the first vessel of war taken by either side. After refitting on her return from Europe, the "Constitution" sailed from Annapolis on the 12th of July, and stood to the northward. Upon this cruise she was chased for three days by the English squadron, composed of the "Africa," 64, Capt. Bastard; "Shannon," 38, Capt. Broke; "Guerriere," 38, Capt. Dacres; "Belvidere," 36, Capt. Byron; and "Eolus," 32, Capt. Townsend, and only escaped capture through the most skillful seamanship of her commander and officers and the perfect discipline and obedience of her crew. The story of the chase is familiar to every reader of American naval history. Not a boat was stove nor an anchor or gun lost.

The "Essex," Capt. Porter, sailed from New York shortly after the departure of Commodore Rodgers, going to the southward. When a few weeks out she discovered a fleet of vessels consisting of a few transports under convoy of a frigate, one of which she made prize of, capturing about 150 soldiers in her. It was Capt. Porter's intention to make a dash at the convoying frigate, but day dawning before he could come up with

her, the attempt was given up; this vessel was said to be the "Minerva," 36. A few days after this success the "Essex" surprised and captured H. B. M. ship "Alert," Capt. Langhorne, mounting twenty 18-pounder carronades, and with a full crew. There was great disparity in the armament and size of the two vessels, but the resistance of the "Alert" was so feeble as to excite surprise. The "Essex" continued to cruise to the southward of the Grand Banks, and at one time was so hard pressed by the enemy's frigates that Capt. Porter determined as a last alternative to make the attempt to carry one of them by boarding in the night. The arrangements for this purpose were so complete as to give reason to think the plan would have been successful.

On the 2d of August, a short time after his famous escape from the English squadron, Capt. Hull sailed from Boston in the "Constitution," and on the 19th, at 2 P.M., lat. 41° 44′ N., lon. 55° 48′ W., a sail was made bearing E.S.E., and to leeward, to which chase was given. At 5 o'clock the chase hoisted three English ensigns, and immediately after opened fire at long range. At 6 o'clock the enemy bore up under his three topsails and jib, with the wind on his quarter; the "Constitution" immediately set her main topgallant-sail and foresail to get alongside. Shortly after the bows of the American frigate began to double on the quarter of the English ship, when the former opened with her forward guns, drawing slowly ahead, both vessels keeping up a close and heavy fire as their guns bore. Just as the ships were fairly side by side the mizzen-mast of the Englishman was shot away, when the American, ranging ahead, luffed short round on her bow to prevent being raked. In attempting this she fell foul of her antagonist, when both parties prepared to board. Both sides now suffered severely by the closeness of the musketry fire, Mr. Morris, the first lieutenant of the "Constitution," being shot through the body. It being impossible to board owing to the heavy sea, the sails were filled on the "Constitution," and as she shot ahead the fore- and mainmast of the enemy fell, leaving her a helpless wreck. Shortly after the enemy struck. She proved to be the "Guerriere," 38, Capt. Dacres, though actually carrying 40 guns,—one of the ships that had so lately chased the "Constitution" off New York. Mr. Charles Morris, the first lieutenant of the "Constitution," was promoted to a post-captain for his part in this brilliant achievement. The loss of the "Guerriere" was 79 killed and wounded; that of the "Constitution," 7 killed and 7 wounded.

Sunday, October 25, the "United States," 44, Commodore Decatur, then in lat. 24° N., lon. 29° 30′ W., captured, after a brief action, H. B. M. frigate "Macedonian," 38, Capt. Carden. On taking possession the enemy was found fearfully cut up, having received no less than 100 round shot in her hull alone. Of 300 men, 36 were killed and 68 wounded. The "Macedonian" was a fine ship, actually mounting 49 guns. The "United States" suffered comparatively little aloft, and but slightly in her hull. She lost 5 killed and 7 wounded. The style in which the "Macedonian" was captured added materially to Commodore Decatur's high reputation, his services were handsomely acknowledged, and Mr. Allen, his first lieutenant, was promoted. These brilliant successes changed the whole current of public opinion on the part of our people, and a feeling of just pride replaced that of despondency.

On the 17th of October, lat. 37° N., lon. 65° W., the "Wasp," 18, Capt. Jones, captured, after a spirited contest, H. B. M. brig "Frolic," 18, Capt. Whinyates. The "Wasp" had 5 men killed and 5 wounded. Capt. Whinyates, in his official report, states that not 20 of his entire crew escaped unharmed. Both vessels were nearly equally matched in size and armament, the advantage in the latter respect being with the English. The conduct, skill, and seamanship displayed in this conflict greatly increased the reputation of the American navy. Capt. Jones and Mr. James Biddle were both promoted, besides receiving other testimonials for their conspicuous gallantry. Both the "Wasp" and "Frolic" were shortly after captured by the "Poictiers," 74.

In lat. 13° 06′ N., lon. 31° W., the "Constitution," 44, Commodore Bainbridge, captured, after an hour's actual fighting, H. B. M. frigate "Java," 38, Capt. Lambert. Though rated at 38, as vessels of a similar class to the "Java" actually carried 49 guns, it is fair to presume this was the case with that vessel. In this combat, though the "Constitution" was a somewhat heavier vessel in all respects, in the difference in the execution of the fire of the two vessels there is a wide disparity. The "Constitution" lost 9 killed and 25 wounded, among the latter Commodore Bainbridge and the junior lieutenant, Mr. Alwyn, who died some time after of his injuries. The "Java," according to the statement of Commodore Bainbridge, lost 60 killed and 101 wounded,—Capt. Lambert mortally; one of her lieutenants, the master, and many of her inferior officers, were slain or seriously hurt. The "Constitution" went into action with her royal yards across, and came out with all in their places, and her injuries were slight. The "Java" lost her three masts and bowsprit, and her hull was greatly injured. No friendly port being at hand to refit the "Java," she was blown up.

On the 24th February, 1813, the "Hornet," 18, Capt. Lawrence, being then about 7 miles off the Demarara River, South America, encountered and, after an engagement of 15 minutes, captured H. B. M. ship "Peacock," 18, Capt. Peake. Shortly after she struck she went down with 3 of the "Hornet's" crew and 9 of her own. The "Hornet" lost 1 man killed and 4 wounded. The "Peacock" lost her captain and 4 men killed, and 33 wounded. The "Hornet" was not materially damaged. The fine handling of the "Hornet" and her superior gunnery quickly decided the day. Inspired by these brilliant successes, Congress empowered the President, in January, 1813, to build 4 ships to rate not less than 74 guns, and 6 frigates to rate 44 guns each; and on the 3d of March ensuing directed 6 sloops-of-war to be built on the sea-board, and as many vessels on the lakes as the public service required.

The space allowed for an article on the navy in a work of this character compels only a brief notice of the famous cruise of the "Essex," 32, Capt. Porter,—a cruise which for boldness of conception, fertility of resource, self-reliance, and indomitable energy and enterprise, is almost without a parallel in any navy. Cutting adrift

from all provided means of supplies, he struck boldly out for the Pacific, capturing and destroying the enemy's commerce wherever found, and for many months he continued, with his consort, the "Essex Jr." (a prize converted into a man-of-war), his work of destruction and depredation. Up to the time of the arrival of the two ships at Valparaiso, about the 1st of February, 1814, the cruise had been one of uninterrupted success, and a brilliant victory over a vessel of equal force alone was wanting to its completeness. Entertaining this sentiment, so characteristic of the officer and man, Capt. Porter concluded to remain in Valparaiso and wait for the arrival of H. B. M. frigate "Phœbe," 36, one of the ships fitted out expressly to search for him. In due time the "Phœbe" arrived, but not alone, being accompanied by the "Cherub," 20, Capt. Tucker. Various devices were resorted to by Capt. Porter to engage the "Phœbe" singly, but without avail. Finally, as he had reason to believe his vessel outsailed both the enemy's ships, he decided to go to sea, and drawing the enemy away from the port, give the "Essex Jr." a chance to escape. This intention was frustrated by the loss of his main topmast off Angel Point in a squall, which compelled his return. Unable to reach the harbor, he anchored about 3 miles from the town, within pistol-shot of the shore, where the Chilians had a small battery. Disregarding the neutrality of Chili and all neutral rights, he was attacked by both the "Phœbe" and "Cherub," and after a most determined and bloody resistance, and a display of unexampled heroism against overwhelming odds, in which his loss was 152 out of a complement of 255 men, he was obliged to yield. The loss of the enemy was 5 killed and 10 wounded, the first lieutenant of the "Phœbe" being among the former. The English ships were cut up more than could have been expected, the "Phœbe" having received, besides other injuries, 18 shot below the water-line. From the dauntless and determined spirit displayed on the part of the Americans in this conflict, it is more than probable the result would have been different had Capt. Porter been able to fight his ship under way. Mr. Gamble, of the marines, who commanded the "Andrew Hammond," another prize of Capt. Porter's converted into a cruiser, was with Capt. Porter's command during most of his memorable cruise. He and his command were, shortly after the loss of the "Essex," captured at the Sandwich Islands by the "Cherub."

The action between the "Chesapeake," 38, Capt. Lawrence, and the "Shannon," 38, Capt. Broke, which resulted in the capture of the former after a sanguinary struggle, occurred on the 1st of June, 1813, about 30 miles off Boston Sound. The capture of the "Chesapeake" is to be attributed to various causes. It is well known that the "Shannon" had been officered and manned with a picked crew with a view to engaging the "Chesapeake," and was in a high state of discipline. The officers of the "Chesapeake," on the contrary, were most of them young and inexperienced, and her first lieutenant, though an officer of merit, was new to his duties. Her crew was a mixed one, raw and disaffected, and composed of a large proportion of landsmen. Under these circumstances it is thought Capt. Lawrence should have declined the challenge of Capt. Broke until the ship and crew were in a better state of preparation. Capt. Lawrence was a man of the loftiest and most chivalrous spirit; and upon a previous occasion, while in command of the "Hornet," having sent a challenge to the captain of the "Bonne Citoyen," he felt it incumbent upon him to accept the gage of battle offered. Few battles have been more sanguinary. The "Chesapeake" lost 48 killed and 98 wounded, the "Shannon" had 23 killed and 56 wounded. On board the "Chesapeake" fell or died of their wounds Capt. Lawrence, Lieuts. Ludlow and Ballard, of the navy, and Broome, of the marines, Mr. White, the master, Mr. Adams, the boatswain, and 3 midshipmen. Mr. Budd, second, and Mr. Cox, third lieutenant, were also wounded. The "Shannon" lost her first lieutenant and one or two inferior officers, and Capt. Broke was badly wounded, the boatswain lost an arm, and one midshipman was wounded. Capt. Lawrence and Mr. Ludlow were both buried at Halifax with military honors.

On the 12th of July the brig "Siren," 14, was captured by the "Medway," 74, after a long chase.

Off Portland, Me., on the 4th September, 1813, the "Enterprise," 14, Lieut. Commandant Burrows, captured, after a heavy combat, H.B.M. brig "Boxer," 14, Capt. Blythe. In this engagement both the commanding officers were killed. Both vessels were fought gallantly. The damage to the American was comparatively slight, while the "Boxer" was badly cut up in her hull, spars, sails, and rigging, and had several guns dismounted. The "Boxer" had 14 men wounded and several men killed; the "Enterprise" 1 man killed and 13 wounded, of whom 3 subsequently died. Capts. Burrows and Blythe were both buried at Portland with military honors. This success was the first that had fallen to the American navy since the capture of the "Chesapeake," and its effect in restoring the confidence of the nation was very great.

In June, 1813, the brig "Rattlesnake," 16, Lieut. Commandant Renshaw, was captured by the British frigate "Leander," 50. After a daring and most successful cruise off the English coast, rivaling in audacity the exploits of Paul Jones, the "Argus," 18, Capt. Allen, was captured by H. B. M. brig "Pelican," 18, Capt. Maples, a greatly superior vessel in armament, the "Pelican" mounting 32-pounder carronades, while the "Argus" carried 24's. The "Argus," in an action lasting three-quarters of an hour, had 2 midshipmen and 4 men killed, and 17 wounded, among the latter Capt. Allen, who subsequently died in the hospital of Mill Prison, and was buried with the honors of war. The "Pelican" lost 7 in killed and wounded.

In June, 1813, the "Constellation" being blockaded near Norfolk by a large English force, several attempts were made to destroy or capture her by boats from the English fleet, all of which resulted in heavy loss to the enemy from the fire of the batteries on Craney Island, and that of our gunboats. In one of the minor conflicts with the enemy, Mr. Sigourney, a gallant and promising young officer, was killed, while defending, sword in hand, his command, the "Asp," then lying in the Yeocomico. She was finally carried by boarding by an overwhelming force, and set on fire and abandoned; but Mr. McClintock, the

officer second in command, upon the enemy retiring again, got on board and extinguished the flames.

About this time the frigates "United States" and "Macedonian" and sloop-of-war "Wasp," under Commodore Decatur, were chased into New London, where they were blockaded, and never again got to sea during the war, though every effort was made to elude the enemy.

For the defense of the bays, rivers, and inlets several small vessels had been fitted out, and among them the "Alligator." While this vessel was lying at anchor near Cole's Island, she was attacked by the enemy's boats. Mr. Bassett, her commander, cut her cables and made sail, and with the assistance of a light breeze, which enabled him to bring his vessel under control, succeeded in defeating the attempt of the enemy and inflicting upon him heavy loss. Mr. Bassett was promoted for his gallantry upon this occasion. The "Alligator" was subsequently capsized in a violent squall in Port Royal Sound, and many of her crew perished.

Among the gallant exploits of the war, those performed by Lieut. Lawrence Reamey are among the most conspicuous. In January, 1815, this officer, in command of 3 barges, captured, under the guns of the English frigate "Hebrus," a heavily-armed tender and launch belonging to that vessel, with 40 men, and a few days later, in the captured launch of the "Hebrus," with a crew of 25 men, he captured a tender belonging to the frigate "Severn," having on board between 30 and 40 men. No more dashing exploits occurred during the war.

In October, 1814, gunboat No. 160, commanded by Mr. Payne, while convoying a number of coasters from Savannah to St. Mary's, was captured by a tender and 10 armed boats after a spirited and obstinate resistance, in which half her crew were killed or wounded. The enemy suffered severely. Mr. Payne was badly wounded.

In July, 1813, gunboat No. 121, commanded by Mr. Shead, was captured by 8 armed boats from the "Innon," 38, and the "Martin," 16, after a persistent défense, in which the enemy lost 7 killed and 12 wounded. No. 121 had 7 men wounded.

During the summer of 1813 our government had but 3 vessels of war at sea,—the "President," 44, the "Congress," 38, and "Essex," 32. Within a year after the declaration of war all the brigs, with the exception of the "Enterprise," had been captured. The loss of these vessels induced a change of policy with the government, and it was decided to build sloops-of-war of a class sufficiently large to cope with anything beneath the small frigates of the enemy. In June, 1814, the "Guerriere," 44, was launched at Philadelphia, and on the 20th July following the "Independence," 74, was launched at Boston. The first two-decked ship that ever properly belonged to our navy—the "Java," 44—was soon after launched at Baltimore. Commodore Rodgers was appointed to the first-, Bainbridge to the second-, and Perry to the third-named vessels. The new sloops-of-war began to get to sea during the summer. The "Frolic," 18, was captured shortly after sailing by H. B. M. frigate "Orpheus," 36, without resistance, as during the chase her guns were thrown overboard. The "Adams," 28, had been cut down at Washington to a sloop-of-war, and lengthened so as to carry 28 guns on a single deck. Under the command of Capt. Morris she succeeded in getting to sea, and after several narrow escapes and an extended cruise, in which she made many captures, she was obliged, on account of damages by grounding, to go into the Penobscot River for repairs, going as far up as Hampden. While the vessel lay ready to be hove out, and with nothing in her, she was attacked by a strong force of the enemy, consisting of troops and vessels of war, and to prevent her capture she was destroyed, the crew all escaping and reaching Portland but 1 man and 1 marine, who fell into the enemy's hands.

On the 28th June, 1814, the "Wasp," 18, Capt. Blakeley, one of the new sloops-of-war, in lat. 48° 36′ N., lon. 11° 15′ W., captured H. B. M. sloop-of-war "Reindeer," Capt. Manners. On the part of the enemy this fight lasted 28 minutes, on that of the "Wasp," 19 minutes. It is conceded the English captain fought his ship with great skill and gallantry. In attempting to board he was mortally wounded. The coolness, skill, and seamanship displayed by Capt. Blakeley during every phase of this conflict has never been surpassed. The "Reindeer" was cut to pieces in a line with her ports. The "Wasp" was hulled 6 times, and she was pitted with grape. She had 5 killed and 22 wounded, among the latter 2 midshipmen, who subsequently died of their wounds. The "Reindeer" lost 25 killed and 42 wounded, her first lieutenant and master among the latter. The prize was destroyed to prevent recapture. On the 1st of September, 1814, Capt. Blakeley, in the same vessel, being then in lat. 47° 30′ N., lon. 11° W., engaged and sunk the "Avon," 18, Capt. Arbuthnot, within sight of her consort, the "Castilian," 18, and two other vessels, one of them known to be a man-of-war. After the engagement, Capt. Blakeley ran off dead before the wind in order to reeve new braces and to draw the nearest vessel from her consort. This vessel, the "Castilian," 18, continued the chase, but after firing a broadside into the "Wasp," hauled her wind to rejoin her sinking consort, who was making signals of distress. The "Avon" is supposed to have lost from 30 to 50 in killed and wounded. The "Wasp" lost 1 killed and 2 wounded. Capt. Blakeley's conduct in the destruction of the "Avon," and his ready preparation to engage the "Castilian" after the destruction of the "Avon," indicate the splendid character and spirit of the man and the school in which he was trained. The last heard of the "Wasp" and her glorious commander was in a letter brought to Savannah on the 4th of November, 1814, in a prize called the "Atlanta," commanded by Lieut. Geisinger. Various conjectures have been formed as to her fate, but it is generally believed she foundered in a gale. Lieut. McKnight, late of the "Essex," and Master's Mate Lyman, passengers, were also lost in her.

In lat. 27° 47′ N., lon. 80° 09′ W., the "Peacock," 18, Capt. Warrington, on the 29th April, 1814, engaged and captured after an engagement of 45 minutes H. B. M. brig "Epervier," 18, Capt. Wales. The loss of the latter was 22 killed and wounded, and at the close of the engagement she had 5 feet of water in her hold,

and in her spars and rigging was extensively injured. The "Peacock" had but 2 men wounded, and her injuries were slight. The prize was put under the charge of Mr. J. B. Nicholson, the first lieutenant of the "Peacock," who, after several critical escapes from the enemy, carried her safely into Savannah. The establishment of peace in Europe, owing to the downfall of Napoleon, enabled England to employ a largely increased force in the prosecution of the war against the United States and in carrying out her policy, which seemed to be twofold,—that of conquest and the infliction of injuries of a partisan character. To meet the operations of the enemy the U. S. government had equipped a force in the Chesapeake under the command of Capt. Joshua Barney. This force consisted principally of barges carrying heavy guns, a few galleys, and one or two schooners. With this force Commodore Barney distinguished himself in defeating the plans and attacks of the enemy, and upon every occasion displayed the highest and best qualities of the officer, notably in the Patuxent, where he resisted successfully the heavy attacks of the enemy, in one of which the "Severn," frigate, or the "Loire," was seriously injured, and in opposing at Bladensburg the march of the enemy upon Washington, where Barney and his flotilla-men, who had left the flotilla to co-operate with the army, sustained a large share of the fighting. Upon this occasion the flotilla in the Patuxent was destroyed to prevent falling into the enemy's hands. With the capture of Washington, for a similar reason, the "Columbia," 44, on the stocks, was destroyed, the "Boston," 28, and the "Argus," 18, beside quite an amount of naval stores. The seamen and marines of the "Guerriere," "Java," and flotilla, under command of Commodore Rodgers, assisted materially in resisting the advance of the enemy upon Baltimore, and in the battle of North Point were conspicuous for valuable service. In the attacks also upon Fort McHenry, the warm and well-directed fire from Fort Covington, manned by men from the "Guerriere," and commanded by Mr. Newcomb, and of Fort Babcock, manned by 50 men from the flotilla under charge of Sailing-Master Webster, together with that of the barges under Lieut. Rutter, assisted materially in the repulse of the enemy. All of these gentlemen were distinguished by their steadiness and efficiency. The complete failure of the enemy in these attacks terminated active operations in the Chesapeake.

In December, 1814, Vice-Admiral Cockburn suddenly appeared off the mouth of the Mississippi, with the intention of making a formidable attempt against New Orleans. Mr. Thomas Ap Catesby Jones with a division of 5 gunboats guarded the entrance of Lake Borgne, one of the approaches to the city. On the 14th of December, 1814, he was attacked by an overwhelming force, consisting of 40 or 50 barges, mounting 42 guns, principally 12-, 18-, 24-pounder carronades, manned by 1200 men, and after a persistent and heroic defense on the part of all engaged, he was forced to yield. Our loss was comparatively light, while the loss of the enemy in killed and wounded is supposed to have reached between 200 and 300, which exceeded the number of the Americans engaged. Lieut. Jones was badly wounded. Mr. McKeever, in No. 23, was the last vessel taken, after a most gallant defense. The country, while regretting so important a loss, looked upon the result against hopeless odds as a triumph.

Capt. Daniel T. Patterson commanded the naval force at New Orleans, and after the capture of the gunboats he had but two vessels remaining,—the "Louisiana," 16, and the "Carolina," 14. The latter vessel rendered signal service, under Capt. Patterson, in assisting Gen. Jackson by threatening the enemy's left flank, and by her galling fire to resist, by a spirited night attack, the first demonstration of the enemy, under Maj.-Gen. Keane, upon New Orleans. Shortly after this vessel, under command of Capt. Henley, was destroyed by the fire of a battery of heavy guns. In this affair 7 men were killed and wounded. All but these escaped, and volunteered to man some of the heavy guns mounted on the American lines, and rendered valuable service in all the subsequent successes under Gen. Jackson in his memorable defense of New Orleans. The "Louisiana" alone remained to co-operate with the army, and in the great battle of the 8th January her services, under Capt. Patterson, were of eminent value. Capt. Patterson also erected a battery on the right bank of the river, which he placed in charge of Capt. Henley, and which rendered important service. Upon the retreat of the enemy, several expeditions in boats were dispatched by Capt. Patterson to harass and cut off the enemy, and Mr. Thomas Shields, a purser, with 6 boats and 50 men, captured one of the enemy's large boats with 40 officers and men belonging to the dragoons and 14 seamen, and immediately after captured a barge, a transport schooner, and 5 other boats, with 83 more prisoners. Sailing-Master Johnson also performed creditable service in destroying a transport and capturing a number of men. In all the important service connected with the defense of New Orleans the navy bore a conspicuous part. Capts. Patterson and Henley, Lieuts. Jones, Thompson, McKeever, Spedden, Cunningham, Norris, and Crowley, with other junior officers, were distinguished for gallant conduct and services. The spirited conduct and gallant exploits of Purser Shields have been before mentioned. The marines under Major McCormick, who was wounded in resisting an advance of the enemy upon the American lines on the 20th of December, bore their share in the glories of this brilliant and decisive campaign.

Upon the commencement of hostilities, the American government caused the "Oneida," 16, to be built on Lake Ontario, where the English had long maintained a small force. Shortly after the English built the "Royal George," a vessel designed to carry 22 guns. On the 29th July, 1812, Lieut. Commanding Woolsey, in command of the "Oneida," then lying at Sackett's Harbor, successfully resisted an attempt to capture this vessel, made by a squadron composed of the "Royal George," 22, "Prince Regent," 16, "Earl of Moira," 14, "Duke of Gloucester," "Seneca," and "Simcoes." This was the commencement of hostilities on the great lakes,—ere the conclusion of the war to become the theatre of grand events. In August, 1812, Commodore Isaac Chauncey was ordered to this important command. With characteristic energy, judgment, and enterprise, under the authority of the

government, he immediately adopted prompt measures to increase our force to an extent commensurate with that of the enemy on Lake Ontario. Several vessels were immediately bought, armed, and equipped, and put in service, and called the "Hamilton," "Governor Tompkins," "Conquest," "Growler," "Julia," and "Pert." Their armament consisted of long guns, mounted on circles, with a few light guns, averaging about 4 guns each. The keel of a ship to carry twenty-four 32-pounder carronades was laid in September. With the "Oneida," the entire flotilla mounted 40 guns, manned by 430 men, including marines. At this time the force of the enemy was more than double that of the Americans in guns and men, and, as cruisers, were greatly superior. On the upper lakes the enemy had two or three vessels, which, for the time, gave them control of those waters before the arrival of Commodore Chauncey at Sackett's Harbor. Lieut. I. D. Elliott was ordered to the upper lakes to purchase suitable vessels for the creation of a suitable force in those waters. On his way in the execution of these orders, learning that the first detachment of seamen for service on the lakes was within a short distance of the Niagara frontier, and that the "Detroit" and "Caledonia," armed vessels of the enemy, were anchored under Fort Erie, he organized, in connection with Capt. Towson, of the army, an expedition for their capture. Beside the officers named, Sailing-Master Watts, of the navy, and Lieuts. Roach and Pressman, of the army, participated. The success was complete, and resulted in the capture of both vessels. The "Caledonia" was brought to the American side. The "Detroit" having grounded on Squaw Island, within reach of the guns of Fort Erie, she was burned by the Americans after removing most of her stores. The enterprise was full of daring, and was the first success on either side in the warfare on the lakes. Congress voted Mr. Elliott a sword, and Capt. Towson acquired great reputation for his part in the enterprise; to his unflinching courage and skill the capture of the "Caledonia" is materially due, while all participating in the glowing achievement deserved and received high praise. Soon after the arrival of Mr. Angus, who was senior to Elliott, the latter rejoined Commodore Chauncey's command. On the 8th November, Commodore Chauncey hoisted his broad-pennant on the "Oneida," 16, Lieut. Commandant Woolsey, and having the rest of his flotilla in company, sailed to cut off the enemy's vessels. Upon this occasion the "Royal George," having sought protection under the forts at Kingston, a spirited engagement between the flotilla and forts followed, but, owing to the coming on of a gale, without material results, and the vessels, on the 10th, returned to Sackett's Harbor. Commodore Chauncey, in the "Oneida," used every possible means to bring on an engagement with the "Royal George," a much heavier vessel, but without success. Brig.-Gen. Smythe, towards the close of November, preparatory to a descent on the Canada shore, requested the co-operation of Mr. Angus, with a naval force, in driving the enemy from the batteries on the Canada side. The night of the 28th November was selected for the occasion. The expedition was divided into two parties, one consisting of 10 boats and 70 seamen, exclusive of officers, under Mr. Angus, accompanied by Capt. King, with a detachment of 150 soldiers, and Mr. Samuel Swartout, of New York, as a volunteer. The other, with 10 more boats and a detachment of 200 strong, was commanded by Col. Boerstler. The arrangements being completed, the expedition left the American shore about 1 A.M. The plan was for one party to ascend the river while the other descended with the current. Upon nearing the shore, the enemy, who were prepared, opened a destructive fire; but the boats, commanded by efficient officers, dashed in and effected a landing. A body of the enemy was drawn up in front of the barracks, known as the Red House, their left flank protected by two guns. As soon as the troops formed the fire was returned.

At this juncture a few seamen armed with pistols and pikes, led by Sailing-Master Watts and Midshipman Holdup Stevens, made a detour around the hill, and charging the artillerists, captured the guns in the most gallant manner, mortally wounding Lieut. King, who commanded them; the remaining troops and seamen charged in front, when the enemy fled to his barracks, where his fire becoming very destructive, it became indispensable to dislodge him. Several spirited young midshipmen, Messrs. Wragg, Dudley, and Holdup Stevens,—neither of whom were yet twenty,—with a few men succeeded in bursting open a window in the barracks, through which an entrance was made, and unbarred an outer door, when Mr. Angus and the seamen rushed in and drove the enemy out. Some confusion here followed, owing to an order to retreat by some irresponsible person, and a portion of the soldiers and seamen embarked. Mr. Angus attempting in vain to stop the retreat, retired with his men. Capt. King, however, with a part of his troops, still remained engaged, and with him a few seamen, with Messrs. Wragg, Dudley, and Stevens at their head. A charge being ordered, the enemy again broke, and fled into a battery; he was driven from place to place until completely routed and all the batteries at that point were captured. The young sea-officers who remained, believing their part of the work accomplished, crossed to the American side in the best manner they could, Messrs. Dudley, Wragg, and Stevens crossing with some wounded men in a leaky canoe, which sunk twice before they reached our shore. The fighting was of the most desperate character, and the impression made by the seamen with their pikes was long remembered. Their loss was equal to their gallantry. Of 12 sea-officers engaged, 8 were wounded, Sailing-Masters Sisson and Watts mortally. Mr. Carter, another master, was wounded; Midshipman Wragg was wounded in the abdomen, Midshipman Graham lost a leg, Midshipman Holdup Stevens received a wound which shattered his hand, Mr. Brailesford was wounded in the leg, and Mr. Mervine received a ball in the side. Most of the seamen who were not killed got back to the American side. Our entire loss on the part of the navy was 30 in killed and wounded, which was quite half of all who landed. Capt. King and several army officers, with about 60 men, having no means of retreat, eventually fell into the enemy's hands. The troops behaved gallantly, and Capt. King was conspicuously dis-

tinguished. Many of the officers were wounded. The enemy was effectually beaten,—batteries carried, barracks burned, guns spiked, and caissons destroyed.

On April 25, 1813, the American squadron, under Commodore Chauncey, consisting of the flag-ship "Madison," Lieut. Commandant Elliott; "Oneida," Lieut. Commandant Woolsey; "Fair American," Lieut. Chauncey; "Hamilton," Lieut. McPherson; "Governor Tompkins," Lieut. Brown; "Conquest," Mr. Wallaby; "Asp," Lieut. Smith; "Pert," Lieut. Adams; "Julia," Mr. Trant; "Growler," Mr. Mix; "Ontario," Mr. Stevens; "Scourge," Mr. Osgood; "Lady of the Lake," Mr. Flinn; and "Raven," transport, having on board a body of 1700 men, under Gen. Pike, appeared off York. All the vessels ran within a mile of the shore to the southward and westward of the principal fort. Two hours after the troops under Gen. Pike were disembarked, and, under cover of a fire of grape from the vessels, a successful landing was effected, with a loss to the army of about 40 men. As soon as Gen. Pike with his command moved to the assault, the small vessels worked up to within 600 yards of the principal fort, when they opened fire upon the enemy, and contributed largely to the success of the day. Commodore Chauncey directed in person the naval operations, pulling in his gig through the enemy's fire, encouraging all by his coolness and conduct. After sustaining some loss by an explosion, which killed Gen. Pike, the place capitulated, and remained in our hands until the 1st of May. The loss to the navy was 14 men killed and wounded. The "Duke of Gloucester," undergoing repairs, fell into our hands, a 20-gun vessel was burned, a number of boats for transportation of troops were taken, and a large amount of naval and military stores were destroyed, after sending a considerable amount to Sackett's Harbor. The navy contributed largely to the success, and the different vessels were well handled.

On May 27, 1813, a combined army and navy demonstration was made against Fort George, resulting in its capture. Upon this occasion Capt. Perry, who was second in command, attended to the disembarkation of the troops. The marines of the squadron were embodied with the regiment of Col. Macomb. The arrangements for landing being completed, under cover of the fleet the boats under Capt. Perry dashed in, and Col. Scott effected a landing, though opposed by a concealed party, who advanced to repel the boats, which was driven back by the grape and canister of the vessels and the steady fire of our troops. When Scott landed the success of the day was assured. He was supported by the remainder of the brigade under Gen. Boyd, and after a short conflict the enemy was driven from the field and retreated towards Queenston. Upon this occasion Lieut. Brown, in the "Governor Tompkins," was highly commended for the handsome manner in which he brought his ship into action, and the splendid execution of his fire. The skill and service of Commodore Chauncey upon this occasion were handsomely recognized by the army and by Gen. Dearborn, the commander-in-chief. Commodore Chauncey commended all acting under him, and made special mention of Capt. Perry and Lieut. McPherson. Lieut. Brown was not named in the despatches, the omission doubtless being an accident; no officer was more distinguished. After the occupation of Fort George the British evacuated the whole Niagara frontier. Capt. Perry was shortly after sent to Erie to superintend the fitting out of the squadron at that place.

About the same time as the descent on Fort George, Sir Geo. Prevost, the British commander-in-chief, and Commodore Sir I. L. Yeo, planned a *coup de main* against Sackett's Harbor in retaliation for the blow they had received at York, and to destroy the new ship building there. The expedition was a failure as regarded its main objects, but owing to false information conveyed to the officer in charge of the store-house most of the stores captured at York, with quite an amount from the sea-board, were destroyed. Every effort was made on the part of Commodore Chauncey to get the new ship afloat, and on June 12 she was launched and placed in command of Capt. Sinclair. She was named the "General Pike." At this time many promotions occurred in the navy: Sinclair was posted, Woolsey, Trenchard, and Elliott made master commandants, and Holdup Stevens, Dudley, Packett, Yarnall, Wragg, Adams, Pearce, Edwards, Ives, Conklin, and Smith were raised to the rank of lieutenants.

Towards the close of the season Capt. Thomas McDonough was sent to assume command on Lake Champlain. In the spring of 1813 our force on that lake consisted of the "President," "Growler," and "Eagle." The two last were shortly after captured by the enemy after a stubborn resistance, and transferred to the British flotilla. In August the enemy appeared off Burlington, and succeeded in destroying some stores and in capturing several small trading-craft. Capt. McDonough now commenced building and purchasing vessels to secure again the command of the lake. In June, Lieut. Chauncey, in the "Lady of the Lake," captured on Lake Ontario a schooner loaded with provisions and ammunition. On June 30, Col. Scott embarked in the vessels of the squadron, landed at York without opposition, and seized a quantity of provisions and ordnance stores, and 5 cannon; 11 boats, built to transport troops, were destroyed.

In the early part of August the squadron sailed from the mouth of the Niagara in pursuit of the English squadron, Commodore Chauncey doing his utmost to bring on an engagement. On the night of the 7th the "Hamilton" and "Scourge" capsized in a squall, and only 16 of the crew of both vessels were saved. On the 10th, while the squadrons were manœuvring for the weather-gauge, the "Growler," Lieut. Deacon, and the "Julia," Mr. Trant, became separated from the rest of the squadron, and were captured after a dashing attempt to run the gauntlet of the English vessels. On the 28th September an engagement occurred between the two squadrons, which resulted in the discomfiture of the English and in chasing them into Burlington Bay. The English flag-ship, in the engagement, lost main and mizzen topmast and main yard, and was only saved from capture by flight and the gallant interposition of the "Royal George," Capt. Mulcaster. It is thought if Sir James Yeo had not borne up when he did, and waited long enough for the carronades of the "Madison" and "Oneida" to reach, his entire force would have

been captured or destroyed. A storm coming on, and for other weighty considerations, Commodore Chauncey was prevented from attacking the English in Burlington Bay. In this affair the late Capt. W. C. Boltin was prominent for the gallant and effective manner in which he handled the "Madison." The "Pike" having for some time borne the brunt of the fight, was a good deal cut up in her hull, spars, and rigging, and by the bursting of her bow-gun 22 men were slain or wounded. On the part of the enemy the "Wolfe" and "Royal George" suffered most,—the former sustained a heavy loss in men. Upon the abatement of the weather on the 29th, Commodore Chauncey, still in pursuit, chased the English squadron again into Burlington Bay. Every precaution was taken to prevent his escape in the thick weather prevailing. Upon the weather clearing a trusty officer was sent in to reconnoitre, who reported nothing was to be seen of the squadron. Commodore Chauncey then ran off the Ducks. It was known afterward that the English fleet had not left Burlington Bay. But for this mistake the English fleet would have been taken, as this end of the lake being near the weather shore our vessels could have safely attacked. At 3 P.M. on the 5th October seven sail were seen ahead, and chase was made; the strangers now set fire to one of their vessels, the others vainly attempting to escape. At sunset, opposite the Real Ducks, the "Confiance," "Hamilton," and "Mary" struck to the "Pike." The "Sylph" captured the "Drummond" cutter, and the "Lady Gore." The other vessel, the "Enterprise," escaped. The prizes were gun-vessels, mounting from one to three guns each, and were used as transports. Two hundred and sixty-four prisoners were taken, including some officers belonging to an English regiment. The "Confiance" and "Hamilton" were the schooners "Growler" and "Julia," taken from us on the night of the 8th August. For the rest of the season Commodore Chauncey was co-operating with the army and in watching the enemy off Kingston. The success of the naval operations for the season was largely with the Americans. The hostile squadrons were three times engaged,—twice the enemy avoided the conflict, and on the third occasion Commodore Chauncey attacked so vigorously with an inferior force as to leave no doubt of the result had not the English vessels put before the wind. The success at York and the fall of St. George, which depended entirely upon the co-operation of the navy, and the captures recently alluded to, were all important results,—rarely or ever before had English officers declined a combat with an inferior force. The more our naval operations on Lake Ontario are studied, the more conspicuous, brilliant, and successful will the services and splendid qualities of Commodore Chauncey appear.

By extraordinary exertions Capt. O. H. Perry, who had been ordered to the command on Lake Erie, assisted materially by Sailing-Master Dobbins, had succeeded, by purchase and building, in organizing at Erie a force of vessels, consisting of the "Lawrence," 20, "Niagara," 20, "Caledonia," 3, "Ariel," 4, "Trippe," 1, "Somers," 2, "Scorpion," 2, "Ohio," 1, and "Porcupine," and on the 4th of August, 1813, by the use of camels, floated the heavy vessels over the 7-foot bar lying at the entrance to the harbor of Erie and anchored outside. At this time the force of the enemy consisted of the flag-ship "Detroit," 19, the "Queen Charlotte," 17, the "Lady Prevost," 13, the "Hunter," 10, and three or four light cruisers, all under command of Capt. Barclay. On the 5th September, Capt. Perry sailed with his squadron in quest of the enemy, and after cruising several days anchored, on account of the illness of Capt. Perry, in Put-in-Bay. On the morning of the 10th, while still at anchor there, the enemy's squadron was discovered bearing N.W., when a signal was made to get under way. The wind was light at S.W., but shortly after changed to S.E., which placed the Americans to windward. About 10 o'clock the enemy hove to in line ahead, heading S.W., and distant about 3 leagues. When within about a league of the enemy, discovering how the enemy had formed, Capt. Perry communicated his order of attack. The English commander had formed his line with the "Chippeway," Mr. Campbell, armed with one pivot-gun, in the van; the "Detroit," his own vessel, next; the "Hunter," Lieut. Bignall; "Queen Charlotte," Capt. Finnis; "Lady Prevost," Lieut. Commandant Buchan; and "Little Belt," astern, in order named. To oppose this the "Ariel," Lieut. Packett, four long 12's, was placed in the van; the "Scorpion," Mr. Champlin, one long and one short pivot-gun, next; then the "Lawrence," Capt. Perry; the "Caledonia," Lieut. Turner, next astern; the "Niagara," Capt. Elliott, followed by the "Tigress," Lieut. Conklin; the "Somers," Mr. Almy; "Porcupine," Mr. Sennalt; and "Trippe," Lieut. Holdup Stevens, in order named, prescribed distance being half a cable's length.

From the commencement of the battle, shortly after meridian, and for two hours, the fire of the enemy was mainly directed against the "Lawrence," her only support being the two schooners ahead, which were gallantly fought. The cannonade had deadened the wind, and during this time there was little air. The "Queen Charlotte" having filled passed the "Hunter," and concentrated her fire with that of the "Detroit," upon Perry's flag-ship, producing great slaughter on board and almost dismantling her. After the firing had continued some time, the "Niagara" hailed the "Caledonia" and ordered her to make room for the former to pass ahead. Mr. Turner immediately bore down upon the enemy, and took up a position closer to his line than any other vessel. At the end of 2½ hours, the enemy having filled and the wind increasing, the two squadrons drew slowly ahead, leaving the "Lawrence" partially out of the fight. At this time the "Niagara" passed to windward of the "Lawrence," steering for the head of the enemy's line, the "Caledonia" falling to leeward. The vessels astern had not been idle, but, by dint of great efforts, had gradually been closing, though not in regular order. The rear of the line seems to have inclined toward the enemy, bringing the "Trippe," Lieut. Holdup Stevens, so near Turner's vessel, the "Caledonia," that the latter had sent a boat to her for a supply of cartridges. Capt. Perry, finding the "Lawrence" thoroughly disabled and dropping out of the combat, got into his gig and pulled for the "Niagara," which vessel

he boarded at half-past two. Soon after the "Lawrence," then a wreck and with hardly a man uninjured aboard, hauled down her colors. After a short consultation between Perry and Elliott, the latter volunteered to go in Perry's boat and order the smaller vessels, already hotly engaged, into closer action, within half-pistol distance of the enemy; this accomplished, Capt. Elliott remained on board and took charge of the "Somers." According to the statement of several of Perry's captains, up to the time Perry arrived on board the "Niagara" and took command of her that vessel had taken but a slight part in the conflict, and was almost uninjured. When the "Lawrence" lowered her colors, the enemy, supposing they had won the day, cheered lustily, and for a few minutes there was a general cessation of firing, both parties preparing for the final struggle. The wind had freshened, enabling the gunboats to close rapidly. At 45 minutes past 2 the "Niagara," then to windward of the leading vessels of the enemy, made signal for close action (which order was received with cheers and obeyed with alacrity), and bore up immediately under foresail, topsails, and topgallant-sail. The enemy observing this, attempted to wear to get fresh broadsides to bear, but in doing so his two ships for a time got foul, throwing his whole line into confusion and bringing the "Lady Prevost" to westward and leeward of the "Detroit." At this juncture the "Niagara" bore steadily down upon the enemy, passing between the "Chippeway" and "Lady Prevost" on the one hand and the "Detroit," "Queen Charlotte," and "Hunter" on the other, and, pouring in both broadsides as she passed, ranged ahead of the ships, and luffing athwart their bows, continued delivering a close, deadly, and raking fire. Simultaneously the "Caledonia," with the gun-vessels, was throwing in at close quarters a raking fire of grape and canister, and 15 or 20 minutes from the time the "Niagara" bore up a hail was passed among the small vessels that the enemy had struck. When the smoke of battle cleared the two squadrons were found partly intermingled; the "Niagara" lay to leeward of the "Detroit," "Queen Charlotte," and "Hunter," and the "Caledonia," with the "Trippe" and another gun-vessel, were between the "Hunter" and "Lady Prevost," while the "Lawrence," with her colors again flying, was astern. The "Little Belt" and "Chippewa" attempting to escape, were chased and captured about an hour after by Champlin in the "Scorpion," and Holdup Stevens in the "Trippe." The opposing squadrons suffered equally in killed and wounded. The "Lawrence" was cut up to a degree almost unparalleled in naval warfare; of her crew, 22 were killed and 61 wounded. When Perry left for the "Niagara" hardly a sound man remained on board. The "Niagara" had 2 killed and 25 wounded. The "Caledonia," Lieut. Turner, though carried into the thickest of the fight and entirely without quarters, had but 3 men wounded. The "Trippe," Lieut. Holdup Stevens, which for some time was as hotly engaged, and was equally without quarters, had 2 men wounded; the "Somers," Mr. Almy, the same; the "Ariel," Lieut. Packett, 1 man killed and 3 wounded; the "Scorpion," Mr. Champlin, 2 killed, one being a midshipman; the others had no one hurt. More than a hundred men of Perry's fleet previously to the action were unfit for duty, and Perry himself, when he met the enemy, was suffering from the effects of sickness, which greatly enhanced the value of his great services and heroic exploits. On the part of the Americans, Lieut. Brooks, commanding the marines, and Midshipmen Clark and Lamb, were killed, and Lieuts. Yarnall and Forrest, Mr. Taylor, the master, Mr. Hambleton, the purser, and Midshipmen Swartout and Claxton, all of the "Lawrence," were wounded. Mr. Edwards, second lieutenant of the "Niagara," and Midshipman Cummings were also wounded. The loss of the English was 41 killed and 94 wounded. The "Detroit" had her first lieutenant killed, and Capt. Barclay and the purser were wounded. Capt. Finnis, of the "Queen Charlotte," was slain and her first lieutenant wounded. The commanding officer of the "Lady Prevost," with the first lieutenant and commanding officer of the "Chippewa," were also wounded. Whatever may have been said and written of the superiority of the Americans in guns and weight of metal over the English in the commencement of the conflict, it must be conceded this advantage was more than offset by the complete disability of the "Lawrence," which ceased to be in the supreme crisis of the fight a factor, and that the complete success of this great and glorious achievement, when defeat seemed inevitable, is due greatly to the unconquerable will and daring spirit of the American commander-in-chief, when he, seizing the opportune moment, bore gallantly down upon the enemy, and, in breaking his lines, shattered his ships by his broadsides and achieved victory and immortal renown. Congress voted to Perry and Elliott each a gold medal, to the commanding officers a silver medal, and to the others a sword; prize-money was given to all. The results of the victory were of the first importance. The English evacuated Detroit, and Perry soon after reached that place in the "Ariel," and, in conjunction with the army, took possession. Perry co-operated with Harrison in his movements against the enemy, and was present with the latter in the battle of the Thames. Most of the upper part of the province fell under our control, and large quantities of military stores were captured.

On the 23d of October, Perry with his squadron transported Harrison's army to Buffalo, where he resigned his command to Elliott, having been promoted to a captain and ordered to command the "Java," 44, then at Baltimore.

Upon Lake Ontario the energetic and indefatigable Commodore Chauncey vied with the English in increasing his force, and in the spring of 1814 the keels of several sizable vessels were laid down by the Americans, and on the 2d of May the "Superior," 50, was launched.

In the early part of May, Sir James Yeo, with Lieut.-Gen. Drummond, having a force of from 1200 to 1800 men, made a descent upon Oswego, and captured a small quantity of stores. The defense, though hopeless, was obstinate. The Americans lost in killed, wounded, and missing 79 men. Lieut. Pearce, of the navy, took part in the defense and fought bravely. The "Growler" was sunk, but was raised and carried off by the enemy, who admitted a loss of 95 men. About the middle of June, Commodore Chauncey sent

Acting Lieut. F. H. Gregory with 3 gigs into the St. Lawrence, where the enemy had a line of gunboats stationed to protect his communications. Mr. Gregory lay in ambush on one of the islands, where he was discovered, and a gunboat sent in chase. Instead of retiring, Mr. Gregory made a dash at the vessel, and carried her without loss. She was armed with an 18-pounder carronade, having a crew of 18 men. While proceeding up the river he was again chased by a much larger gunboat, carrying 2 guns, which compelled him to scuttle and abandon his prize. Two days later Mr. Gregory, accompanied by two gallant lake seamen, Messrs. Vaughan and Dixon, destroyed at Presque Isle a cruiser nearly ready to launch, intended to carry 14 guns. Mr. Gregory was promoted for these gallant exploits. Subsequently this brave officer, while reconnoitring off Kingston in a gig, was pursued by 2 barges of the enemy, carrying 20 men, and after sustaining the loss of Midshipman White, who was killed, and having 5 out of a crew of 8 wounded, was compelled to surrender.

During the season no encounter occurred between the hostile squadrons, ours being employed in watching, blockading, and harassing the enemy, and in transporting troops and stores for the army operating on the frontier. On the 19th of November, Midshipman McGowan, accompanied by Mr. Johnson, a famous partisan, attempted to blow up the "St. Lawrence," 120, recently built and supposed to be at Kingston; being discovered, 2 boats were sent in pursuit, which he captured, with as many men as his own crew numbered, when, learning that the "St. Lawrence" was not in Kingston, he returned to Sackett's Harbor.

To counteract and oppose the movements of the enemy, who contemplated, it was thought, a descent upon Northeastern New York, the command of Lake Champlain, flanking as it did for 200 miles the march of an invading army, became of the first importance. With this object both parties during the spring of 1814 were actively engaged in building and equipping vessels and gunboats. About the middle of May, while the American squadron lay in Otter Creek, a force under Capt. Pring, consisting of the brig "Linnet" and 8 or 10 galleys, made an ineffectual attempt to fill up the channel with vessels loaded with stones. On the 3d of September, Commodore McDonough anchored his squadron off Plattsburg, the point selected for defense, on the flank of our troops intrenched there. About this time Sir George Prevost, with an army of 12,000 men, advanced against Plattsburg, then held by Gen. Macomb, with a force of about 1200 effective men. Commodore McDonough selected an anchorage a little to the southward of the mouth of the Saranac, with his vessels in line parallel to the shore, running north and south, and distant from the western shore 2 miles. The "Eagle," 20, Capt. Henley, lay at the northern extremity of the American line; the "Saratoga," 26, McDonough's flag-ship, second; the "Ticonderoga," 17, Lieut. Commandant Cassin, third; the "Preble," 7, Lieut. Charles Budd. The last vessel was anchored near the shoal to prevent the enemy passing that end of the line. The Americans had also 6 large and 4 small gunboats, each of the former carrying a long 24 and an 18-pounder columbiad, and each of the latter one long 12. The American force consisted of 14 vessels in all, mounting 86 guns, with a total complement of 850 men, including officers, and a small detachment of soldiers. To complete his order of battle, Commodore McDonough placed 2 of the gunboats inshore of the "Eagle," and the rest of the gunboats were placed in the intervals between the different vessels, thus forming two lines, distant from each other about 40 yards. The force of the enemy was largely in excess of that of the Americans. The "Confiance," Capt. Downie, carrying on her gun-deck thirty long 24's, an armament similar to that of the "Constitution"; on her topgallant forecastle she mounted a long 24 in circle, and 4 heavy carronades, and on her poop-deck 2 heavy carronades, making in all 37 guns. The "Linnet," Capt. Pring, carried sixteen long 12's; the "Chubb," Lieut. McGhee, carried ten 18-pounder carronades, and one long 6, and the "Finch," Lieut. Hicks, one 18-pounder columbiad and four long 6's. In addition, the English had 12 or 13 gunboats, 8 mounting 2, and the remainder 1 gun each. Their whole force consisted of 16 or 17 vessels, mounting in all 95 guns, and carrying about 1000 men. About 8 A.M. of the 11th of September the enemy stood in, with the wind northeast, to the attack. When the two squadrons were distant about a league, the enemy hove to to complete his line of battle, and as soon as his gunboats were in position the English filled with their starboard tacks aboard, and headed for the American squadron in line abreast; the "Chubb" heading well to windward of the "Eagle," the "Linnet" steering for the bows of the same brig, the "Confiance" shaping a course far enough ahead of the "Saratoga" to lay that vessel athwart hawse, and the "Finch," with the gunboats, standing for the "Ticonderoga" and "Preble." The Americans were anchored with springs. In addition, Commodore McDonough had run out a kedgeboard on each bow, and brought the hawsers in upon each quarter, letting them hang in bights below the water. To this seamanlike and wise provision the victory to a degree is due. The action was opened by the "Eagle," and as soon as her shots began to tell Commodore McDonough sighted a long 24-pounder and fired. The shot is said to have struck the "Confiance" in the outer hawse-hole, and, passing the whole length of her deck, killed and wounded several of her crew and disabled her wheel. Immediately all the long guns of the Americans opened, and it was soon apparent that the English flag-ship was suffering severely. Still she kept on in the most gallant manner, hoping to get to close quarters, when the overpowering battery of the "Confiance" would soon decide the day. Finding this impossible under the telling fire of the Americans and the baffling of the wind, Capt. Downie determined to anchor head and stern, but in using the kedge astern with this object the hawser fouled, when the starboard bows was let go, and the kedge became almost useless. The "Linnet" anchored soon after in a good position nearer than the "Confiance," and forward of the "Eagle's" beam. The "Chubb" kept under way, intending if possible to rake the American line. The "Finch" got abreast of the "Ticonderoga," supported by the gunboats. As soon as the "Confiance" was secured, Capt. Downie, with his whole broadside,

opened with fearful execution upon the "Saratoga." It is supposed by this single broadside one-fifth of her crew were killed or wounded. Among the killed was the first lieutenant, Mr. Gamble, and Acting Lieut. Vallette was the only officer left of that rank on board the "Saratoga" at this early stage of the action.

The battle now became general. The "Chubb," about a quarter of an hour after the enemy anchored, while manœuvring near the head of our line, was disabled by the fire of the "Eagle," and drifting down between the contestants, a shot was fired into her by the "Saratoga," when she struck, and was taken possession of by Midshipman Platt, and anchored near the mouth of the Saranac. About an hour later the "Finch" was crippled and driven out of her position by the "Ticonderoga," and drifting down upon Crabb Island, was taken possession of by the invalids belonging to the hospital. At this end of the line the enemy's gunboats made desperate attempts to close, and forced the "Preble," soon after the capture of the "Finch," from her place in line to a position considerably inshore, where she was of no further service. This accomplished, the enemy turned their attention to the "Ticonderoga," and so determined were some of these assaults that several times the gunboats laid in their sweeps preparatory to boarding, but the cool, determined fire they encountered defeated every attempt. At the other end of the line the Americans were suffering severely. The "Linnet" secured a commanding position, while the "Eagle" was so situated—her springs having been shot away—as not to be able to bring her guns fairly to bear on either the "Confiance" or "Linnet," who were firing into her. Capt. Henley now shifted his berth, and took up a position, anchoring by the stern, between the "Saratoga" and "Ticonderoga," necessarily a little inshore of both, and opened with better effect on the "Confiance" and her supporting gunboats; this change, unfortunately, left the "Saratoga" exposed to the raking fire of the "Linnet." Shortly after, the fire of the "Saratoga" and "Confiance" materially lessened. On the "Saratoga" every gun in her starboard battery was disabled,—nothing remained but to wind the ship, which McDonough, through the timely provisions already alluded to, succeeded in accomplishing, and her fresh broadside was brought to bear upon the "Confiance," which ship also attempted to wind, but failed, and having borne for some time the fresh broadside of the "Saratoga," until she had barely a gun to return the fire, the English commander-in-chief, two hours and a quarter after the commencement of the battle, lowered his flag. The "Saratoga's" broadside was immediately brought to bear upon the "Linnet," which vessel struck fifteen minutes later, when all the enemy's gunboats lowered their colors. All but two of these finally escaped, owing to the disabled condition of the large vessels, which required the crews of our gunboats at the pumps to prevent their sinking. This prevented pursuit. Our total loss was 52 killed and 51 wounded. The English lost 57 killed and 110 wounded on board the large vessels, and the two gunboats captured lost 30 in killed and wounded between them. The slaughter on board the gunboats that escaped is believed to have been very heavy. Though a report was circulated to the contrary, the English gunboats were well fought, and bore a conspicuous part in the conflict. Many of the American officers were wounded, though but two commissioned line-officers were killed,—Mr. Gamble, the first lieutenant of the "Saratoga," and Mr. Stansberry, the first lieutenant of the "Ticonderoga." Mr. Smith, the first lieutenant of the "Eagle," though severely wounded, after his wounds were dressed returned to his post, and remained during the action. Besides Capt. Downie, who was killed, the English lost several officers, and three or four were wounded. Both squadrons were fearfully cut up in hull, spars, and rigging. Commodore McDonough, by his consummate skill, heroic endurance, and indomitable courage, won in this splendid triumph a reputation second to none in the long line of our great naval captains. He was promoted and honors showered upon him. Capt. Cassin, who was throughout this memorable contest conspicuous for his heroic and determined courage in the defense of the rear of our line and for noble conduct, received high praise and merited honors, and all participating received also their share in distinction and honors. Mr. Vallette was specially mentioned, and the services of Mr. Brum, the master who superintended the winding of the "Saratoga" in the climax of the fight, were handsomely acknowledged. Capt. Henry and Lieut. Commandant Cassin gave merited praise to all under their command. Messrs. Conner, Breese, Robins, and Stellwagen, in command of gunboats, fought gallantly. Capt. Downie has been censured for his mode of attack, which brought him for some time under a raking fire,—a plan of attack which had been successfully adopted by the English in their naval fights with the European naval powers. That he was not successful with his largely superior force is to be attributed to the firm and unconquerable courage and magnificent gunnery of his adversaries. During the progress of the fight Sir George Prevost was skirmishing in front of the American works and preparing for a grand attack. The fate of the day was scarcely determined when he commenced a hasty and disorderly retreat, leaving behind him many of his heavy guns, stores, and supplies. From that time to the end of the war the northern frontier was cleared of the enemy.

In August, 1814, Commodore Sinclair, then in command on the upper lakes, made an unsuccessful attempt upon Mackinaw, though several vessels belonging to the Northwest Company were captured and a block-house destroyed. On the night of the 12th August the "Somers," "Ohio," and "Porcupine," while lying at anchor near the outlet of Lake Erie engaged in protecting the left flank of the American works, were attacked by six or eight heavy bateaus manned by a party of seamen under Capt. Dobbs. The "Ohio" and "Somers" were both surprised and captured, but the "Porcupine," having timely warning, escaped. The American loss was 1 killed and 10 wounded. By the resistance on the "Ohio" the enemy lost about the same. Lieut. Radcliffe, of the "Netley," was slain. On the night of the 3d September, Lieut. Worsley with five large boats, one conveying a 6- and another a 3-pounder, accompanied by 19 canoes and about 200 men, surprised at St. Joseph, owing

to the darkness of the night, and captured, after every officer on board of her was shot down, the "Tigress," Lieut. Champlin,—this vessel had a complement of 28 men and carried a 24-pounder. The enemy's guns were transferred to the vessel, and the evening of the next day Lieut. Turner, in the "Scorpion," anchored about 5 miles from her. The next morning, at daylight, the "Tigress" stood down, under American colors, towards the "Scorpion," and Turner, having no cause to suspect her change of character, permitted her to get close alongside, when she fired all her guns, ran the "Scorpion" aboard, and captured her after a slight resistance. Lieut. Turner was honorably acquitted, the surprise being attributable to the want of signals. In capturing the "Tigress" the enemy lost a lieutenant and 2 men killed and 7 wounded.

Capt. Steward having succeeded Commodore Bainbridge in command of the "Constitution," sailed in the winter of 1814 for a cruise through the West Indies, upon which occasion he captured the "Picton," 14, and made several prizes, and subsequently returned to Boston. On the 17th December she again sailed. On the morning of the 25th February, 1815, the "Constitution," then off the coast of Spain, captured, after an actual contest of about three-quarters of an hour, the "Cyane," a frigate-built ship, with an actual armament of 34 guns, and the "Levant," carrying 21 guns. The splendid seamanship of Capt. Stewart in the handling of the "Constitution" in the encounter with these two vessels, by means of which he not only succeeded in avoiding a raking fire by the enemy, but in raking both his opponents, has always been regarded with admiration by professional men. The "Constitution" lost 3 killed and 12 wounded. Capt. Stewart estimates the loss of the "Cyane" at 12 killed and 26 wounded, and on the "Levant," 23 killed and 16 wounded. Capt. Stewart proceeded with his prize to Port Praya, where he arrived on the 10th March. While lying here a heavy English force appeared in the offing, and knowing that the English would disregard all neutral rights unless supported by force, Capt. Stewart promptly got under way with his prizes and proceeded to sea. The English prisoners ashore manned a battery and fired at the "Constitution" as she passed out. The cool, prompt, decided conduct of Capt. Stewart in getting to sea saved his command. The ships in chase proved to be the "Leander," 50, "New Castle," 50, and "Acosta," frigate. The "Levant" was chased back into Port Praya, where she anchored within 150 yards of a strong battery. The enemy, disregarding the neutrality of the port, opened fire from all his vessels. After sustaining this for some time, Mr. Ballard, the officer in charge, lowered his colors. The reputation of Capt. Stewart, already very high, was largely added to by his conduct on this occasion. The "Constitution" arrived safely at Maranham, where he landed his prisoners, and, hearing that peace had been declared, sailed for New York, where he arrived the middle of May. Thus ends for the war the exploits of the noble "Old Ironsides," a ship dear to every American heart.

On the night of the 14th November, 1814, the "President," 44, in command of Commodore Decatur, in attempting to cross the bar at New York in the night got out of the channel, and, grounding upon the hard bottom, was considerably injured. It was impossible to return owing to the adverse tide, and as a strong blockading force was in the offing it was necessary to carry sail to get off the coast before morning. At daylight 4 ships were discovered in chase, when Commodore Decatur immediately commenced lightening. Soon after 3 o'clock P.M. the "Endymion," 40, the nearest vessel, opened with her bow-guns, the "President" returning the fire with her stern-chasers. Finding the fire of the "Endymion" very annoying, and that she was gradually gaining, Commodore Decatur determined to make an effort to exchange ships by carrying the "Endymion" by boarding, which intention was received with joy by his crew. All attempts to close, however, failed, when Commodore Decatur directed his efforts to dismantling her, and for two and a half hours the two frigates kept up a heavy fire, when the "Endymion's" sails being cut from her yards she fell astern. At this time the "President" was under all sail, and by choosing her position could have forced the enemy to strike, but the near approach of the other ships compelled Decatur to resume his original course to escape them. All efforts were made for the purpose, but by 11 P.M. the "Pomona," 38, got on the weather bow of the "President," and poured in a broadside; the "Tenedos," 38, was fast coming up on the quarter, and the "Majestic," razee, was within gunshot astern, when Commodore Decatur yielded. The loss of the "President" was 24 men killed and 56 wounded. Among the slain were the first, fourth, and fifth lieutenants, Babbit, Hamilton, and Howell. Much of the loss occurred from the fire of the "Pomona," who continued her fire after the signal of surrender was made. The "Endymion" lost 11 killed and 14 wounded. The fact that this vessel did not join the other ships for three or four hours after shows her crippled condition. The "President" was taken to Bermuda, where Decatur and his crew were paroled. He was acquitted with honor for the loss of his ship.

Off Tristan d'Acunha, on the 23d March, 1815, at 1.40 P.M., the "Hornet," 18, Capt. Biddle, engaged H. B. M. brig "Penguin," 18, Capt. Dickinson. For 15 minutes both vessels kept up a close and sharp cannonade, when the enemy, finding the fire of the "Hornet" too hot, bore up with the intention of boarding. The enemy's bowsprit came in between the main and mizzen rigging of the "Hornet," affording the opportunity, but the attempt was not made. The vessels lay in this position for a few minutes, the Americans pouring in a raking fire, when the sea lifted the "Hornet" ahead, the enemy swinging round and hanging on her starboard quarter. Capt. Biddle ordered the foresail to be set, when the enemy called out that they surrendered, but after this two marines fired at and wounded Capt. Biddle quite seriously, when the crew of the "Hornet" poured in a volley and shot them dead. The two vessels were equal in size, armament, and weight of metal and crew, but notwithstanding the "Penguin" had the advantage of the wind she was taken in 28 minutes. The "Penguin" lost 14 killed and 28 wounded. Among the slain was her commander and the boatswain; among the wounded a lieutenant, a midshipman, and the purser. The "Penguin" was completely riddled, and

lost both lower masts and bowsprit. The "Hornet" had 1 man killed and 10 wounded, including Capt. Biddle and Mr. Connor, her first lieutenant, whose life for a time was in great danger. The "Hornet" was a good deal cut up in her sails and rigging, otherwise her injuries were slight. A few hours after the action a suspicious sail heaving in sight, Capt. Biddle towed the "Penguin" some distance off the land and scuttled her, after taking such stores and provisions as he required. Shortly after the "Hornet" was chased by the "Belvidere," 74, and he only escaped capture by lightening his vessel and throwing overboard his battery. At times the "Belvidere" was so near that her shot passed beyond the "Hornet." Arriving at San Salvador, Capt. Biddle learned of the peace, when he sailed for New York, arriving on the 3d of July. For his splendid achievement in the capture of the "Penguin" Capt. Biddle received distinguished honors. The action between the "Hornet" and "Penguin" was the last regular action of the war.

In the Straits of Sunda, on the 30th June, 1815, the "Peacock," Capt. Warrington, captured the East India Company's schooner "Nautilus," 14, but Capt. Warrington on learning, a few days after, that peace had been ratified, gave her up. Government was about fitting out two flying squadrons of small vessels when peace was declared, and all operations ceased. Thus closed the war of 1812, a war in which the American navy, by the splendid prowess and signal successes over a power that had never found its equal upon the sea, covered itself with glory. The nation points with just pride to the exploits of our illustrious line of naval heroes, and as long as the republic lasts their gallant deeds will be remembered and honored.

At the breaking out of hostilities between the United States and Great Britain the Barbary powers, particularly Algiers, committed wanton aggressions upon our commerce, which at the time the government could not properly redress. These powers were little better than communities of pirates, to whom tribute for a long time had been paid by every nation, England included. Shortly after the termination of the war with that country war was declared by the United States against the dey of Algiers, and two squadrons were fitted out to punish him for his aggressions and perfidy. One was commanded by Commodore Bainbridge, and the other by Commodore Decatur, the former being appointed commander-in-chief. Decatur, with a squadron composed of 3 frigates, 1 sloop-of-war, 4 brigs, and 2 schooners, sailed from New York, May 20, 1815, for the Mediterranean. On June 17 an Algerine frigate was made out, which Decatur, in the "Guerriere," engaged and captured. She proved to be the Algerine frigate "Mashouda," 46 guns, commanded by Admiral Rais Hammada, who was killed. Shortly after, off Cape Palos, another Algerine corsair, the "Estudio," carrying 22 guns, was captured. On June 28, Decatur's squadron anchored in the Bay of Algiers, and in 24 hours, by his decision and firmness, Decatur succeeded in compelling a treaty such as had never before been obtained from any of the Barbary powers. With the prestige of this success Decatur appeared with his squadron in the Bay of Tunis on July 26, and immediately made certain demands upon the bashaw of Tunis, which, after some blustering on the part of the bashaw, were complied with. The United States was the first nation to compel these faithless powers to a recognition of maritime rights without the continuance of tribute, and her example being followed by other nations, these petty states soon declined into their proper insignificance. Since this time our relations with these people have been generally satisfactory.

In 1815, Commodores Rodgers, Hull, and Porter were appointed a Board of Navy Commissioners, and charged with all duties relating to the provision of supplies and stores, and the construction, armament, and employment of vessels. In 1819–20 Congress passed an act for the gradual increase of the navy, and authorized the building of 12 line-of-battle ships, 14 first-class and 3 second-class frigates, 6 sloops-of-war, and a proportionate number of small vessels.

In 1821 an expedition was fitted out for the suppression of piracy in the West Indies, where it prevailed to an alarming extent. On October 16, Lieut. Lawrence Kearney, commanding the "Enterprise," captured 2 piratical schooners and 1 sloop, with about 40 pirates. On October 29, Capt. Henley, of the "Hornet," captured the schooner "Moscow," which he sent into Norfolk. In the month of December following Lieut. Kearney destroyed the rendezvous of the pirates off San Antonio. On January 7, 1822, Lieut. Rammage, commanding the "Porpoise," destroyed 5 piratical vessels and broke up their depot on the north side of Cuba. On March 6, Lieut. Kearney captured 3 piratical launches and 4 barges with their crews, numbering about 160 men. On August 16, Lieut. Gregory, commanding the "Grampus," captured off Porto Rico the privateer "Palinurus," carrying one long brass 18, and eight 18-pounder carronades, with a complement of 85 men, her character as a pirate being well established. In the month of November, Lieut. Wm. H. Allen, commanding the "Alligator," an officer of great merit and distinction, was killed, with 2 of his men, in a successful attack upon the pirates. In September, Capt. Cassin captured, in the "Peacock," 5 piratical vessels. In February, 1823, piracy being still on the increase, our force in the West Indies was largely augmented, and placed under command of Commodore Porter. The Porto Rico privateers having upon several occasions interrupted our commerce, Commodore Porter sent a communication to the authorities upon the subject. Lieut. W. H. Cocke, in command of the "Fox," in attempting to enter the port of St. Johns in order to ascertain the probabilities of an answer, was killed by a shot from the castle, which opened a heavy fire upon the vessel and forced her to anchor. It is supposed that this was in retaliation for the capture of the "Palinurus." On the morning of April 8, Lieut. Stribling, in the "Gallinipper," captured the schooner "Pilot," formerly of Norfolk, commanded by the notorious buccaneer Domingo. About the same time Capt. Cassin captured a piratical felucca and broke up several piratical establishments, compelling the pirates to destroy 3 of their schooners. In July, Lieut. Watson, in the "Gallinipper," accompanied by the "Mosquito," Lieut. Inman, having a complement all told of 25 men and officers, attacked and captured a large piratical topsail schooner

and an armed launch, having on board about 80 men, most of whom were destroyed. The schooner was the "Catalina," commanded by the noted pirate Diaboleto, who was killed in action. In the same month Kearney, in the "Greyhound," and Newton, in the "Beagle," landed a force at Cape Cruz, and after a sharp encounter broke up a piratical settlement, burnt several houses, and captured some guns. In 1824, Skinner, of the "Porpoise," captured a schooner, and Paine, in the "Terrier," recaptured a French ship from the pirates. To add to the difficulties Commodore Porter encountered in his operations against the freebooters, there was an evident collusion between the authorities of some of the islands and these outlaws.

In October, Lieut. Platt, commanding the "Beagle," learning that one of our merchants residing at St. Thomas had been plundered, and that the pirates had taken the goods to Foxado, a small port of Porto Rico, proceeded thither to recover the property. On making known the object of his visit, he and Lieut. Ritchie, who accompanied him, were both arrested and detained under guard for a day. Commodore Porter upon learning this, with his characteristic promptness, proceeded to Foxado to demand explanation and redress. Finding that the authorities, upon his arrival there, intended to fire into his vessel, he landed a force, took their batteries, and compelled from the offenders the amplest apologies. Unfortunately, for this thoroughly justifiable retaliatory act Commodore Porter was relieved of his command, and Commodore Warrington succeeded him. This officer continued to carry out the plan of operations inaugurated by Commodore Porter.

In March, 1825, Lieut. Sloat, in the "Grampus," fitted out a trading-sloop with a complement of 27, all told, to capture a piratical vessel cruising off St. Thomas. The expedition resulted in the destruction of the pirate ship; 2 of her crew were killed and 10 made prisoners, among them being the celebrated piratical chief Colfrecinas, who, with the others, was executed by the authorities of Porto Rico. In May, Lieut. McKeever co-operated with the English in breaking up a piratical retreat and in capturing a large piratical schooner. These severe lessons finally broke up the nefarious business, and piracy, as an organization, ceased.

In February, 1832, Commodore Downes, in the "Potomac," arrived off Quellah Battoo for the purpose of chastising the natives for their piratical attack upon the ship "Friendship," of Salem. An expedition was fitted out from the "Potomac," and officered by Lieuts. Shubrick, Hoff, Ingersoll, and Mr. Totten, of the navy, and Lieut. Edson, of the marines. The Malays made a determined resistance, but were finally overcome, and several of their forts captured and destroyed. The lesson, though severe, was salutary and needed, and the good effects of this well-deserved punishment still continue in our intercourse with these semi-piratical people.

The United States Exploring Expedition sailed from Hampton Roads on the 19th August, 1838, under command of Lieut. Charles Wilkes. Midshipman Spencer and two of the petty officers of the brig "Somers" were executed on board that vessel December 1, 1842, for conspiring to capture the vessel and convert her into a pirate. Commander Slidell Mackenzie, the officer in command, felt compelled to adopt this summary course for the security of the vessel and the preservation of the lives of those under his charge. Upon his arrival in the United States a court of inquiry was ordered to inquire into all the facts connected with the transaction, which resulted in a complete and thorough justification of Commander Mackenzie and his officers.

In October, 1842, Commodore Thomas Ap Catesby Jones, commanding the Pacific Squadron, took possession of Monterey, Cal., under the supposition that war existed between the United States and Mexico; shortly after, receiving advices to the contrary, the town was restored. Subsequently, and upon the declaration of war between the two countries, Commodore Sloat, then in command of the Pacific Station, took possession of California, and hoisted the American flag at Monterey, San Francisco, and other points. Shortly after Commodore Sloat was relieved by Commodore Stockton, whose services were very valuable in securing the newly-acquired territory to the United States. Detachments of sailors and marines were left to hold the various points taken possession of. While occupying Los Angeles, the capital, information was received that Lieut. Gillespie, of the marines, with his command, were besieged in the government-house. The "Savannah," Capt. Mervine, went immediately to his relief. A landing was made of a strong force at San Pedro, and a march then commenced upon Los Angeles. When within about four miles of that place, they were met in force by a party of the enemy, having the advantage of a field-piece, by means of which the advance of our men was checked, and the command fell back upon San Pedro. Shortly after Commodore Stockton arrived and sailed for San Diego. From this point an expedition was fitted out for the purpose of re-occupying Los Angeles, which Lieut. Gillespie had been compelled to abandon, and of forming a junction with Col. Fremont, who was marching southward. While preparations were making for this purpose intelligence was received of the severe check Col. Kearney had received at San Pasqual, and of his critical condition. Lieut. Gray, of the navy, with a force of 200 men, was immediately sent to his relief, and soon after Col. Kearney, with the remainder of his command, arrived at San Diego. When Commodore Stockton's preparations were completed, he took up the line of march for Los Angeles with a force of about 600 men. On the 7th January the command arrived at the San Gabriel River, where the enemy were found strongly intrenched. On the next day our forces attacked vigorously, led by Commodore Stockton in person, and drove the enemy from the field. On the 9th, Commodore Stockton advanced upon the town, where he was again met by the enemy on the plains of Mesa. A sharp cannonade followed, the Mexicans making several abortive attempts to charge. After a final effort, Gen. Flores abandoned the defense, and moved off towards Sonora. Soon after re-occupying Los Angeles, Commodore Stockton was joined by Col. Fremont, when the combined forces amounted to 1000 men. Negotiations were entered into with Don Andreas Pico, the governor of California, by which the Mexicans agreed to lay

down their arms and yield quiet possession of the province. Thus to the navy mainly belongs the acquisition of California, with all its untold wealth. To Commodores Sloat and Stockton, for prompt and energetic management and firm and determined measures in these emergencies, the country owes a deep and lasting debt of gratitude. Shortly after these important occurrences, Commodore Stockton, having learned that Commodore Shubrick had arrived to take command of the naval forces in the Pacific, returned overland to the United States. In August, Capt. Lavalette took possession of Guaymas. In September, 1847, Lieut. S. C. Rowan landed with a party at San Blas and destroyed a number of guns. A very creditable affair occurred at Muleje, in which Lieuts. G. W. Hainson and E. Higgins, with Midshipmen Lewis and Crabbe, participated in the destruction of a Mexican brig by boats from the "Cyane." Later, Lieut. Hainson, with three of the "Cyane's" boats, successfully resisted an attack at Mazatlan of the enemy with a greatly superior force. On the 11th November, 1847, Commodore Shubrick occupied Mazatlan—the most important Mexican seaport on the Pacific—without opposition. On the 20th November, two parties—one in boats under Lieut. S. C. Rowan, and one on land under Lieut. G. L. Selden—were sent to disperse a force of the enemy about 10 miles from Mazatlan, which resulted in the total rout of the enemy. Our loss was 1 man killed and 3 officers and 17 men wounded; that of the enemy 7 killed and about 30 wounded. In the same month Commander Selfridge landed at Guaymas and drove the enemy from the place. Commander Selfridge was the only one wounded, while the enemy lost some 30 in killed and wounded.

On the 19th of November, Lieut. Heywood, with 4 officers, 20 marines, and the same number of volunteers, while occupying San José, Lower California, was attacked by 150 of the enemy. Lieut. Heywood upon this occasion repulsed the enemy, inflicting upon him severe loss. On the 22d of January, 1848, a detachment of Lieut. Heywood's command, consisting of Passed Midshipmen Duncan and Warley, with 6 men, were captured on the beach by a large party of the enemy's cavalry,—a serious loss to the little garrison. In the latter part of January the enemy again appeared in force at San José, and fired upon all who showed themselves. Several bold and daring sorties were made by the little garrison who occupied the old mission building for the purpose of checking the advance of the enemy. On the morning of the 12th Passed Midshipman McLanahan was mortally wounded, and survived but two hours. On the evening of the 14th the "Cyane" arrived and dropped anchor off the town. The next morning Commander Dupont, with 102 officers and men, landed and marched to the relief of the beleaguered garrison. Upon their approach Heywood sallied from the fort, and, charging upon the enemy, effected a junction with the relieving party. The loss to Dupont, though spiritedly opposed, was but 4 slightly wounded, while the enemy lost at least 13 killed. The casualties to Heywood's command during this heroic defense of 16 days, in which there was scarcely a time in which he was not under fire, were 3 killed and 4 wounded, while the enemy suffered a loss of 15 killed and many wounded. The high courage, inflexible resolution, and heroic endurance displayed in this remarkable defense against an active, vigilant, and untiring enemy with a largely superior force, places it side by side with the most brilliant achievements in American naval history. Aside from these various duties, the navy was employed on the west coast of Mexico in blockading her ports and in destroying her commerce. In the Gulf of Mexico, at the commencement of hostilities, Commodore Connor commanded our naval forces, and a system of rigid blockade was at once established. In addition to these duties, the navy was employed co-operating with the army whenever its services were required and could be made available. During the battle of Palo Alto, Maj. Monroe, in command of the depot at Point Isabel, having requested the aid of the navy, 500 seamen and marines were landed under Capt. Gregory for the purpose. On the 18th of May a detachment of 200 seamen and marines, under Capt. Aulick, effected a junction with a detachment of the army at Barita, about 15 miles from the mouth of the Rio Grande, and established a post. On the 23d of October, Commodore Perry, with several light-draft vessels, ascended the Tabasco River and took possession of Frontera, capturing all the vessels in port, including 2 steamers. Pursuing his way still farther up the river, several merchant vessels were captured, and the noon of the next day he reached Tabasco, where some opposition was encountered. Commodore Perry having effected the object of the expedition, he ordered the prizes to move down the river while the armed vessels followed. One of the prizes grounded near the shore, when the enemy opened fire upon her; the officer in charge, Lieut. Parker, defended her gallantly, and got his vessel off with 1 man killed and 2 wounded. In carrying a message from the commodore to Lieut. Parker, a very gallant and promising young officer, Lieut. Charles W. Morris, received a fatal wound, of which he died in a few days. Later an unsuccessful demonstration was made against Tabasco, which failed on account of the grounding of the steamer "McLane" on the bar, and also one against Tuspan, which resulted in the loss of the brig "Truxtun" and the capture of most of her officers and crew. In November an expedition was fitted out against the place, which resulted in its capture without opposition. On the night of the 20th of November, Lieut. Parker, Passed Midshipmen Rodgers and Hynson, with 5 men, destroyed the bark "Creole," loaded with munitions of war, anchored under the castle and guns of San Juan de Ulloa. On the 5th of December Passed Midshipman Rodgers and Dr. Wright, of the "Somers," landed for the purpose of a reconnoissance, but were surprised by a party of Mexicans. Dr. Wright made his escape, but Mr. Rodgers was made prisoner and taken to the city of Mexico, from whence, after enduring great hardships, he made his escape, and, joining the army of Gen. Scott, served with distinction during the final battles of the war. On the 8th of December the brig "Somers," in carrying sail to cut off a vessel attempting to enter the harbor of Vera Cruz, was struck by a squall and foundered, carrying with her the gallant Clemson and Hynson and 40 men.

Upon this occasion boats from the English, French, and Spanish men-of-war succeeded in rescuing quite a number. Gold and silver medals were given by the government to the participants in the rescue in acknowledgment of the gallant and humane assistance rendered. On the 20th of December, Commodore Perry took possession of Laguna, in the province of Yucatan, and seized all the military stores.

In March, 1847, Gen. Scott having decided upon the investment of Vera Cruz, the navy was employed in landing troops, provisions, and munitions of war for this purpose. Through the able and judicious arrangements of Commodore Connor, this was effected speedily and without loss. Gen. Scott made acknowledgment in the most forcible language for the valuable assistance rendered. Pending the bombardment of Vera Cruz, the health of Commodore Connor having failed, he was relieved by Commodore Perry. On the 22d of March the investment of the city being established, surrender was demanded. Upon this being refused, the batteries, assisted by the "Spitfire" and "Vixen," with 5 gunboats under the command of Tatnall, having taken up a position near the shore, opened fire; this position was gallantly maintained during the day. On the morning of the 24th, Tatnall, with his command, moved up still nearer, when it becoming apparent that he was in a highly exposed position, signal of recall was made. The officers of the navy naturally anxious to take an active part in the operations of the siege made known their desire, when Gen. Scott readily assigned a place in the trenches for the establishment of a naval battery of three 8-inch Paixhans and three long 32's, under the superintendence of Commander Mackenzie. The battery was served by detachments from the larger vessels, each detachment serving 24 hours, and was first opened under the command of Capt. Aulick, on the 24th, with marked effect until the supply of ammunition failed. The loss from this detachment was 5 killed and 1 officer and 4 men wounded. The relief arrived in the afternoon under the command of Capt. Mayo, who spent the night in repairing the breastworks, shattered by the severe fire of the enemy. Early on the 25th the fire of 4 heavy batteries was turned upon these works. Capt. Mayo opened a well-directed fire, which continued until half-past 2 P.M., when the enemy's guns were silenced. Two other batteries now opened upon him, which were soon rendered inefficient. Upon this occasion Midshipman Shubrick was killed while sighting a gun; 1 seaman was also killed and 3 wounded. In the evening Capt. Mayo was relieved by a detachment under Capt. Breese. The night was passed in repairing damages. The next day orders were received to discontinue fire, as negotiations were in progress for surrender. In the capitulation, Capt. Aulick represented the navy, and on the 29th of March city and castle were occupied by the army and navy under a grand salute from ships and batteries. Immediately after the fall of Vera Cruz, it was arranged that a combined attack should be made on Alvarado. Commodore Perry was to approach by the river, while Gen. Quitman, with a sufficient force, was to attack in the rear for the purpose of cutting off the retreat of the enemy, and securing a large amount of cattle and other supplies of the enemy in the neighborhood of the place. The main object of the movement was frustrated by the gallant but overzealous conduct of Lieut. Hunter, who attacked and occupied both Alvarado and Tlacotalpan before the arrival of either Perry or Quitman's commands. Shortly after Commodore Perry proceeded against Tuspan, which was occupied after a feeble resistance. The guns and ordnance stores of the "Truxtun," lost at the mouth of the river, were recovered. Capt. Mayo, who had been appointed governor of Alvarado, secured the submission of many of the interior towns. On the 16th of June, Commodore Perry again entered Tabasco after a weak resistance. A large quantity of military stores were destroyed, cannon brought off, the powder-magazine blown up, and the fortifications of the city demolished. Commander Bigelow, who was left in command, adopted prompt measures to punish the guerrillas operating in the neighborhood. At many points occupied by Commodore Perry provisional governors were appointed, the ports opened, and custom-house regulations established under our officers. During the latter part of the war, a detachment of marines under Lieut.-Col. Watson served with the division of Gen. Quitman, and took part in the storming of the fortress of Chapultepec, the storming-party, led by Maj. Twiggs, being composed of volunteers and marines, a party of sappers and miners under Capt. Reynolds, and a detachment of regulars from Gen. Twiggs's division under its own officers. The gallant and lamented Twiggs was killed on the first advance, but through a severe and withering fire the stormers pushed on with resistless force, and, sweeping all before them, captured the Mexican works, when the gallant party fought their way into Chapultepec by the side of their army comrades. The marines also acquired distinction in the attack upon the Bela gate, and were among the first to enter the city. Lieut.-Col. Watson, with his command, was placed in charge of the palace to preserve order and keep out plunderers. Lieut. Semmes and Passed Midshipman Rodgers, who served as volunteer aids, were specially commended for distinguished conduct in the battles around the city of Mexico. Shortly after the occupation of the city of Mexico peace was declared.

In the year 1848, Lieut. William F. Lynch sailed in the "Supply" with an expedition under his command to explore the river Jordan and the Dead Sea. In May, 1850, an expedition sailed from New York, consisting of the brigs "Advance" and "Rescue," for the purpose of searching for Sir John Franklin. In June, 1855, Kane's expedition and Hartstene's, for the same purpose, followed. In 1854, Commodore Perry, while in command of the East India Squadron, succeeded in establishing commercial relations with Japan. While Commander Kelly was at Shanghai in the "Plymouth," 1854, a combined attack of the American and English naval forces was made upon the encampment of the Imperialists in retaliation for aggressions committed by them. The Imperialists suffered severely. About this time an American pilot-boat was captured by the Imperialists, which was retaken in the most gallant style by Lieut. Guest in a boat of the "Plymouth." In the latter part of June, 1853, while Commander

Ingraham, in the sloop-of-war "St. Louis," was at Smyrna, he received information that a Hungarian refugee with an American passport and papers had been arrested by some Austrian officials and placed on board an Austrian brig. Commander Ingraham immediately made a demand for his release with the guns of the "St. Louis" bearing upon the Austrian, both vessels being cleared for action. Koszta, the Hungarian referred to, was finally released, and the spirited action of Commander Ingraham received the highest commendation from the government, and a gold medal was voted by Congress in recognition of his prompt, energetic, and patriotic conduct. In January, 1854, Lieut. Isaac G. Strain landed at Caledonia Bay for the purpose of exploring a route across the Isthmus, recommended as suitable for a ship-canal. About this time, in accordance with instructions, Capt. Hollins, in the sloop-of-war "Cyane," bombarded and destroyed the town of San Juan de Nicaragua, in retaliation for various outrages committed upon the persons and property of American citizens. On the 28th of September, 1854, the sloop-of-war "Albany," Commander Gerry, sailed from Aspinwall, and no trace of her having been discovered, is supposed to have foundered at sea.

In 1855, Commander John Rodgers, in the sloop-of-war "Vincennes," penetrated farther the Arctic Ocean, through Behring Strait, than any previous navigator. In the summer of 1855, Commander Boutwell, in the "John Adams," visited the Feejee Islands, and destroyed several villages in retaliation for outrages committed on our countrymen, and compelled the high chiefs to a promise of good conduct. During this year Lieut. James Gillis began to publish the results of his astronomical observations, and Lieut. M. F. Maury his wind and current charts, which have been of great value to the navigator and the interests of commerce. In 1855 a board was convened, under a law of Congress, by the Secretary of the Navy for the reorganization of the navy. Upon a forced construction of the law this board met in secret session, and officers were arraigned, tried, and sentenced without any intimation being given to the parties affected that they were even upon trial. Ninety officers of all grades were dismissed or dropped, and 150 placed on furlough or the reserved list. The whole proceeding was so repugnant to the entire country and opposed to all principles of justice, that Congress passed a bill for the relief of all affected,—every officer under this new legislation was afforded a fair hearing, and the opportunity to know wherewith he had been charged. In most instances where the revisory boards were appealed to for redress the work of the Star Chamber Inquisition was annulled, and the officers restored to their rights and rank. Of those who composed this secret organization some took the first occasion to desert their flag and country in the war of the Rebellion; others, in the time of trial, were found wanting, and passed into oblivion, while among the foremost for zeal, ability, and service, and distinguished for conspicuous gallantry in the national struggle for life, many were found who had been condemned by these men as unworthy to serve the country. During the year 1857, Berryman, in the "Arctic," was employed in running a line of deep-sea soundings across the Atlantic, to establish the practicability of laying wires across the ocean for telegraphic purposes. Our naval forces were engaged in arresting unlawful expeditions against Nicaragua, in resisting the exercise of the right of search by British cruisers in the neighborhood of Cuba, and in demanding and enforcing redress from the government of Paraguay for an insult to our flag and injuries to our citizens. The English bark "Resolute," abandoned in the Arctic Ocean and picked up by Capt. Buddington, in command of a New London whaler, was restored by the United States to the English government. In the beginning of 1858 the exploration of the Paraguay, under Lieut. Page, which had been interrupted by the Paraguayans, was resumed. In April, 1858, Lieut. Almy, in the "Fulton," compelled the release, at Tampico, Mexico, of 6 American vessels that had been illegally seized and detained. Lieuts. Craven, of the navy, and Michler, of the army, who had been employed in surveying a route for a ship-canal from the Atlantic to the Pacific, by way of the rivers Atrato and Truando, returned in June to New York. In August, Capt. Kelly, in the "Saranac," compelled by a display of force at San Juan del Sur, in Nicaragua, the release of two American citizens who had been unjustly imprisoned. In the same month Commander Sinclair visited Waga, one of the Feejees, and inflicted summary punishment upon the natives for the murder of two American citizens. In November, 1858, Flag-Officer Lavalette, in the "Wabash," visited Beyrout, Syria, to investigate the outrages committed upon our citizens, and the murder of Mr. Dickson near Jaffa. All but one of the party implicated were arrested, tried, and summarily punished.

War of the Rebellion.—The war of the Rebellion, that had been so long threatening, and finally inaugurated by the firing upon Sumter, found the country in a most untoward state of preparation. Our vessels were scattered in remote seas, and such was the condition of the navy that it might be reasonably supposed the conspirators against the nation's life had made the dispersion of our men-of-war a part of their scheme to assist in breaking up the Union and in carrying out their designs. Orders were immediately issued for the return of most of the national vessels from abroad, and a proclamation of blockade issued. To enforce the blockade, vessels of all description that could in any way be made serviceable for these purposes, or improvised as armed vessels, were purchased, and with the regular vessels of war were divided into two squadrons,—the one known as the Atlantic Blockading Squadron, under Flag-Officer Stringham, the field of whose operations extended from the Capes of Virginia to Cape Florida; the other the Gulf Squadron, under Flag-Officer Mervine, embracing the Gulf of Mexico from Cape Florida to the Rio Grande.* The sound of North Carolina affording more

* Soon after the secession of Virginia information was received at Washington of the designs of the Confederates upon the navy-yard at Norfolk. Several vessels of war, under a distinguished officer, were immediately ordered thither. Acting under instructions of the Navy Department, with a sufficient force for its protection, the great naval station, with an immense amount of valuable property in ships, guns, munitions of war, provisions, etc., was abandoned without a struggle. The "Merrimac," afterward converted into a powerful iron-clad, was one of the abandoned vessels.

than ordinary facilities for the evasion of the blockade, an expedition, under Flag-Officer Stringham, was fitted out in August, 1861, for an attack upon the defenses of Hatteras Inlet. It consisted of the flag-ship "Minnesota," Capt. Van Brunt; the frigate "Wabash," Capt. Mercer; steam-sloop-of-war "Pawnee," Commander S. C. Rowan; "Monticello," Commander J. P. Gillis; revenue-cutter "Harriet Lane," Capt. Faunce; "Adelaide," Commander H. S. Stellwagen; "George Peabody," Lieut. Commanding R. B. Lowry; and tug "Fanny," Lieut. Commanding Pierce Crosby, and a military force, 800 strong, under Gen. B. F. Butler. The inlet was defended by Forts Hatteras and Clarke, mounting heavy guns. The fire of the fleet, which opened about 10 A.M. of the 28th August, drove the enemy from Fort Clarke; the troops having been successfully disembarked, moved up the beach, and at 2 P.M. took possession. Early the following morning the fire from the fleet was renewed upon Fort Hatteras with such effect that before noon the enemy surrendered to the navy and army, and the fort was occupied by our troops. The enemy lost largely, but not a single casualty occurred on our side. The military force being insufficient, the important advantage gained could not be immediately followed up by securing a foothold on the mainland. With the breaking out of the Rebellion a flotilla, under the command of Commander J. C. Ward, was organized to prevent the obstruction of the Potomac River by the enemy through the erection of batteries. This gallant and accomplished officer was killed in October, 1861, in the prosecution of his arduous duties while in the act of sighting a gun to clear the way for a landing at Matthias Point. Commander Ward was the first officer of the navy killed in action during the war. Shortly after the capture of Hatteras Inlet the Atlantic Squadron was divided. Capt. L. M. Goldsborough was appointed to the North Atlantic Blockading Squadron, to guard the coasts of Virginia and North Carolina, and Capt. S. F. Dupont to the command of the South Atlantic Blockading Squadron, which comprised the coasts and waters of South Carolina, Georgia, and Florida. In February, 1862, the Gulf Squadron was also divided,—Flag-Officer McKean was appointed to the East Gulf Blockading Squadron, and Flag-Officer D. G. Farragut to the West Gulf Blockading Squadron, the dividing point being just eastward of Pensacola, which was included in the latter squadron.

North Atlantic Blockading Squadron.—Early in January, 1862, a joint naval and military expedition, under Flag-Officer Goldsborough and Gen. Burnside, moved from Hampton Roads for operating in the waters of North Carolina. The naval force consisted of the steamer "Valley City," Lieut. Commanding S. C. Chaplin, bearing the flag of Flag-Officer Goldsborough; "Delaware," Lieut. Commanding J. P. Quackenbush, bearing the divisional flag of Commander S. C. Rowan; "Stars and Stripes," Lieut. Commanding Reed Werden; "Louisiana," Lieut. Commanding Alexander Murray; "Hetzel," Lieut. Commanding H. K. Davenport; "Underwriter," Lieut. Commanding William N. Jeffers; "Commodore Perry," Lieut. Commanding C. W. Flusser; "Commodore Barney," Lieut. Commanding R. S. Renshaw; "Hunchback," Lieut. Commanding E. R. Colhoun; "Southfield," Acting Volunteer Lieut. Commanding C. W. F. Behm; "Morse," Acting Master Peter Hayes; "Whitehead," Acting Master C. A. French; "Lockwood," Acting Master G. W. Graves; "Henry Brinker," Acting Master J. E. Giddings; "J. N. Seymour," Acting Master F. S. Wells; "Ceres," Acting Master J. McDirmid; "General Putnam," Acting Master W. S. Hotchkiss; and "Shawsheen," Acting Master T. J. Woodward,—all light-draft vessels, with a total armament of 48 guns, most of them of heavy calibre. These vessels arrived about the 15th of January in the neighborhood of Roanoke Island, the first objective-point. It was not until some weeks later the army were ready for co-operation. Roanoke Island lies between Pamlico and Albemarle Sounds, being separated from the mainland by Croatan Sound, a shallow body of water. Opposite the southern extremity of the island the mainland juts out in a low marshy point, around which the vessels' course lay. On the morning of the 7th of February, the army being in readiness, the fleet moved up Croatan Sound in three columns, commanded respectively by Lieuts. Werden, Murray, and Davenport, the whole under the immediate command of Commander S. C. Rowan. The defenses in this direction consisted of a double row of piles and sunken vessels between the batteries on Polk and Wier Points, and behind these obstructions the enemy's vessels, 8 in number, were drawn up. The attack upon the enemy's defenses commenced at half-past 10; by noon the action became general, and was continued so hotly that, at 2 P.M., the barracks behind the fort on Polk Point were burning furiously. At half-past 4 the enemy's batteries ceased firing, and five of the enemy's steamers, apparently injured, retired behind the point, when the first landing of troops took place. This was effected at Ashby's Harbor, the point selected for debarkation, where a large force of the enemy were drawn up, but were soon dispersed by shrapnel from the "Delaware." By midnight some 10,000 of the troops were landed, when they were joined by six launches from the fleet, with their howitzers and crews, to hold the road during the night and be ready for work in the morning.

At 9 o'clock the next morning a continuous firing in the interior showed that Burnside was hotly engaged, when the vessels moved up and re-opened upon the forts, continuing the fire until, the firing in the interior beginning to slack, Flag-Officer Goldsborough concluded our troops were approaching the rear of the batteries, and made signal to cease firing and to proceed to clear the way through the obstructions, which the vessels burst through about 4 P.M., when the American flag was hoisted over the works at Pork Point. Shortly after, the enemy set fire to the works on Red Stone Point, and to a steamer which had taken refuge under its guns. Thus, after a two days' struggle, Roanoke Island fell into our hands. Retreating from Roanoke Island, the enemy's vessels fled towards Elizabeth City, while Commander Rowan, with 14 vessels, followed in pursuit. On the morning of the 10th they were discovered drawn up behind a battery of four heavy guns, and, moored to the opposite bank, lay the schooner "Black Warrior," carrying two heavy 32-pounders. When within

range fire was opened upon our vessels, which moved steadily on until within 1200 yards, when Rowan made signal, "Ahead, full steam," and dashed at the enemy, opening at the same time a vigorous fire. Completely demoralized by the suddenness and rapidity of the movement, the "Black Warrior" was set on fire by the enemy, the battery abandoned, and the entire fleet captured or destroyed. Pushing on, the flotilla took possession of Elizabeth City, and Lieut. Murray was sent with a small flotilla to Edenton, of which he took possession, and proceeded to obstruct the Albemarle and Chesapeake Canal, which he thoroughly accomplished. At the same time Rowan proceeded up the Chowan River as far as Winton, where, on the 19th, a sharp engagement occurred; but the next morning Col. Hawkins entered the town and destroyed the military stores and quarters found there. Commander Rowan having been left in command of the naval forces in the sound, a combined expedition of the navy and army was organized for an attack on Newbern, N. C. The fleet and transports proceeded up the Neuse River, and anchored, on the evening of the 12th of March, off Slocum's Point, the place selected for the debarkation of the troops. Early the following morning our vessels opened upon the landing-place with grape and canister to clear the way, when the troops landed. As soon as this was effected, the "Delaware" (flag-ship), with a supporting vessel, proceeded up the river on a reconnoissance, when they were fired upon by Fort Dixie, and a spirited engagement ensued, which lasted until dark. At daylight, on the 14th, Burnside, having with him a battery of howitzers under Lieut. R. S. McCook, engaged the enemy in force, while Rowan advanced steadily up the river with his fleet. The river was obstructed by piles and torpedoes, and at distances of from half a mile to a mile and a half formidable batteries of heavy guns were erected; but under pressure of the combined attack the enemy abandoned their defenses in succession, and at noon the fleet anchored off the deserted town of Newbern. A large amount of public stores fell into the hands of the navy, and were turned over to the army, who arrived and took possession of the town at 2 P.M. On the 21st, Lieutenant Commanding Murray took possession of Washington, N. C. In the beginning of April, Commander Rowan sent to New York 9 vessels loaded with captured naval stores. Fort Macon, Beaufort harbor, N. C., next engaged the attention of the army and navy. On the morning of the 25th of April, Commander Samuel Lockwood, with 3 steamers,—the "Daylight," "State of Georgia," and "Chippewa,"—opened fire upon the fort, and continued for about an hour and a half, when the vessels were obliged to haul off on account of the heavy sea. Towards evening a flag of truce appeared on the fort; negotiations for surrender followed, and terms of capitulation were agreed upon by Burnside on the part of the army, and Rowan on that of the navy. The army having failed to accomplish the object for which it was landed at Elizabeth City,—in destroying the canal,—Lieut. Hurser was dispatched for the purpose with 3 gunboats and 2 steamers, which duty he effectually accomplished.

On the 3d of March the enemy's ironclad "Merrimac," supported by several small gunboats, made an attack upon the frigates "Cumberland" and "Congress" off Newport News. The defense, though determined and valorous, was hopeless against this invulnerable monster, upon whose sides the heaviest shot from our vessels made no impression. Ramming the "Cumberland" just under the fore-chains, and inflicting mortal injuries, the noble vessel sank beneath the waters, carrying down with her many of her wounded, whom it was impossible to remove. The gallant and indomitable Morris commanded her, and fought his ship for two hours against all hope. In reporting to his commanding officer, he writes: "I will only say, in conclusion, all did their duty, and we sank with the American flag at the peak." The "Cumberland" lost, in killed and missing, a third of her crew. While the "Merrimac" engaged the "Cumberland" the smaller vessels attacked the "Congress." Her commander, seeing the fate of the "Cumberland," slipped his moorings and ran his vessel ashore. At half-past 3 the "Merrimac" opened upon her, directly astern, at a distance of about 150 yards. The smaller vessels of the enemy also opened. To oppose this fire the "Congress" had but 2 stern-guns, which were soon disabled. Lieut. J. Smith, the noble commander of the "Congress," fell mortally wounded about half-past 4, when the command devolved upon Lieut. Pendergrast. This officer, seeing the rapid slaughter of his men, finding it impossible to bring any of his guns to bear, with his ship on fire in several places, and with no prospect of relief, decided to lower his colors. An officer from the "Merrimac" boarded the vessel, ordered her surrender, and directed her crew to leave, as he intended to burn her. A sharp fire from the shore compelled the party to leave, when the enemy again opened fire, hauling off finally to engage the "Minnesota," which had grounded within a mile and a half of Newport News in coming to the relief of the "Congress" and "Cumberland." Fortunately, the heavy draft of the "Merrimac" prevented her getting nearer than a mile, but the 2 smaller vessels of the enemy opened with their rifle-guns and inflicted considerable damage until driven off by the heavy gun of the "Minnesota," when all three steamed towards Norfolk. While the "Minnesota" lay in this critical condition, Worden, in the "Monitor," appeared about midnight upon the scene. At 8 o'clock the next morning the "Merrimac" again approached. When within a mile of the "Minnesota," Worden got under way and went to meet her; then followed a contest upon the results of which not only the fate of the "Minnesota" depended, but also to a large degree the destinies of the Union and the fate of a great people,—a contest which was destined to revolutionize the whole system of naval warfare and operations, and give rise, in this regard, to a new order of things. With a sublime faith, an unerring judgment, and a stout heart, nobly Worden went to meet the grave and weighty responsibilities resting upon him. For four hours the furious combat raged between the monster "Merrimac" and the tiny "Monitor"—the Goliath and David of the deep—without apparent injury to either vessel, when the enemy retreated to Sewell's Point. Towards the close of this remarkable engagement the gallant Worden was

disabled by the explosion of a shell which struck the look-out slit in the pilot-house, through which, at the time, he was looking. The command then devolved upon his sturdy and courageous executive, Lieut. Dana Greene. No single encounter ever attracted throughout the civilized world so much attention, and rarely in history has the fate of a great nation been so dependent upon a single result. But for the genius of Ericsson, who planned the "Monitor," and the skill and courage of Worden and those who fought her, what would the pen of history have written!

Gen. McClellan occupied Yorktown May 14, and immediately requested the co-operation of the navy in his advance upon Richmond. On May 7, Gen. Franklin's command, while debarking from the transports at West Point, was heavily attacked by the enemy, when the immediate assistance of the navy was requested. Lieut. Commanding T. H. Stevens, in the "Maratanza," and Lieut. Wilkes Henry, in the "Sebago," moved up as near to the enemy's position as possible and opened fire. The assistance rendered to the army upon this occasion was of great value, and enabled Franklin to repulse the attack and hold his ground. The next day a division of gunboats under the command of Lieut. Commanding Stevens, comprising the "Maratanza"; "Chocura," Lieut. Commanding T. H. Patterson; "Marblehead," Lieut. Commanding S. Nicholson; "Sabago," Lieut. Commanding W. Henry, and another gunboat, proceeded up the Pamunkey River to open the way and in support of McClellan's advance. Stevens, in the "Chocura," proceeded as far as the White House, distant 12 miles from Richmond, arriving opportunely to give support to the cavalry advance under Col. L. Williams. Subsequently, Lieut. Commanding Murray, with an expedition of gunboats, went some distance beyond that point and destroyed a large amount of the enemy's property, including 2 large steamers and 25 vessels, Lieut. Commanding Stevens having in the mean time been ordered to the James River to take part in the contemplated attack upon the battery at Drury's Bluff. On the 8th of May the "Monitor" opened fire upon the Sewell's Point batteries, when the "Merrimac" came out, but showed no disposition to engage. Two days after, Norfolk surrendered to Gen. Wool, and the next morning the "Merrimac" was blown up by the enemy. About this time Commander John Rodgers, in the "Galena," with the "Aroostook," Lieut. Commanding J. C. Beaumont; "Monitor," Lieut. Commanding Wm. N. Jeffers; "Port Royal," Lieut. Commanding George Morris, and "Naugatuck," arrived at Drury's Bluff, 8 miles from Richmond, where a heavy battery had been erected, which Rodgers with his command opened upon. The fire was kept up for 3 hours, when the ammunition giving out, and the "Galena" being badly cut up, the vessels withdrew. On the 4th of July, Lieut. Commanding T. H. Stevens, in the "Maratanza," captured the enemy's gunboat "Teazer," near Haxhall's Landing. She was provided with all the appliances for laying down torpedoes, and had on board a large balloon for reconnoitring purposes.

During the summer the navy was employed on the James in co-operating with the army and in keeping the James River open, and at the battle of Malvern Hill the fire of the gunboats contributed materially to the success of the day. On the 5th of September, Rear-Admiral S. P. Lee relieved Goldsborough (who had asked to be relieved) in command of the North Atlantic Blockading Squadron. In the sounds of North Carolina the navy was constantly occupied during the summer in assisting the army to hold the occupied points and in aiding the movements. On the 6th of September the enemy attacked and entered Washington, N. C., but were driven out by the timely action of Lieut. R. T. Renshaw, who opened fire from the "Louisiana" upon them. About the 1st of October an unsuccessful combined movement was made upon Franklin, Va. Upon this occasion numerous acts of distinguished gallantry were performed, and Lieut. Commanding Flusser, who commanded on the part of the navy, specially commended the intrepid and dashing Cushing to the notice of the Department. In the latter part of November the enterprising Cushing led an expedition which had for its object the destruction of salt-works and vessels engaged in the contraband trade, and the capture of public property at Jacksonville, N. C., in all of which he was successful. On his return his vessel, the "Ellis," grounded. All attempts to lighten her proved unavailing. Everything was removed to the schooner in company, but the pivot-gun, some stores, and 6 men, who volunteered to remain with their commander, when she was ordered to drop down. The next morning a heavy cross-fire was opened upon the "Ellis," which soon disabled the engine, but the brave little party held on until the time came when they must either surrender or attempt to escape in the small boat. The "Ellis" was fired and abandoned, and the gallant party happily escaped to the schooner and passed out to sea. On the 29th of December the famous "Monitor" foundered off Hatteras with 4 officers and 12 of her men; the rest of the crew were saved through the coolness and gallantry of her commanding officer, Lieut. Bankhead The year 1863 was spent by the North Atlantic Blockading Squadron in constant activity in guarding the extended coast, penetrating the rivers and sounds, repelling attacks upon occupied points, and protecting and aiding the army in times of difficulty and embarrassment.

On the 17th April, 1864, the enemy besieged Plymouth, N. C., and two days after the iron-plated ram "Albemarle" descended the Roanoke and attacked the wooden gunboats off that town, sinking the "Southfield," and disabling the "Miami," whose gallant commander, Lieutenant Commanding Flusser, was killed, and obtained possession of the river. The next day the defenses of the town were carried, the garrison made prisoners, and the control of the upper sounds passed into the enemy's hands. On the 5th May the enemy besieged Newbern, when the ram again came out. Capt. Melancton Smith, the senior naval officer, promptly engaged her with the "Mattabassett," "Wyalusing," "Sassacus," and "Whitehead." After an engagement lasting 3 hours, the ram retired up the river. On the night of the 27th October, Lieut. W. B. Cushing, who had been selected for the duty, with 14 men in a light picket launch, having attached a torpedo of great power, ascended the Roanoke River to Plymouth,

approached the ram under a heavy fire and sunk her. A shot from the "Albemarle" just as the torpedo exploded sunk the launch. Cushing with four of his daring party escaped miraculously, the remainder were killed or wounded. This dashing and brilliant achievement accomplished, Commander Macomb with his command pushed into the town, drove the enemy out and took possession of the place with all its armament, and re-established the supremacy of the government in the waters of North Carolina. In July, 1864, Lieut. Cushing, with Ensign J. E. Jones and Master's Mate William Howertt and 15 men, made a daring reconnoissance to Wilmington, and returned with valuable information in regard to the enemy's fleet and fortifications off Wilmington. In the fall of 1864, the government having decided upon a demonstration against Fort Fisher and the defenses of Wilmington, Admiral D. D. Porter was assigned to the command of the naval forces, and Gen. B. F. Butler those of the army. On the 18th December, Admiral Porter sailed from Beaufort with all the monitors and smaller vessels, and off New Inlet, N. C., was joined by the larger war-vessels and transports assembled there. Preparatory to the attack a novel experiment was first to be tried, in the attempt to blow up Fort Fisher by the explosive power of a large quantity of powder placed in a vessel called the "Louisiana," fitted for the purpose. The gallant and chivalrous officers volunteering for this extremely perilous enterprise were Commander A. C. Rhind and Lieut. Preston, both of whom had been already conspicuous in dashing enterprises. On the night of the 23d the powder-boat was towed so near the shore that the guns in the casemates of Fort Fisher were distinctly to be seen. The vessel being in position, the fuzes, etc., were lighted by the brave little party, who then took to the boat and pulled away. In about an hour a terrific explosion occurred, but without the hoped-for results, no material damage being done to the fort. The morning after the explosion the fleet appeared off Fort Fisher and opened fire, to which the fort replied briskly for some time, and then relapsed into silence under the concentrated fire of the fleet. Two of the enemy's magazines were blown up. On the 25th the transports arrived, when the fleet again opened fire. Upon an arranged plan 3000 troops landed about 5 miles from the fort, and a reconnoissance was made in the neighborhood of the works. Two light batteries and a few men were captured. Gen. Butler having decided that the works were uninjured as works of defense, and could only be reduced by a regular siege, for which he was not prepared, withdrew his command to the transports and returned to Fortress Monroe. The fleet remained and kept up a steady fire. On the 8th of January, 1865, Gen. Grant having decided to send a competent force, Gen. Terry with his command arrived at Beaufort. A plan of operations having been decided upon between Admiral Porter and Gen. Terry, the troops under cover of the fire of the fleet were all landed by 2 P.M. of the 14th. The next day was appointed for the grand attack. At 9 A.M. the fleet opened a vigorous fire, which was sustained throughout the day, and the enemy were soon driven to their bomb-proofs. Sixteen hundred sailors and 400 marines, under Lieut. R. K. Breese, were landed to join in the assault. When the army was put in motion, the men from the fleet were ordered to advance also; the former to assault on the land side, the latter on the sea front of the fort. The attack on the part of the navy resulted in a repulse, though the demonstration served a good purpose in diverting the attention of the enemy, who supposed this to be the main attack, so that the army met with less opposition. The fire from the fleet was kept up on those portions of the fort held by the enemy, the direction of the fire being changed as the traverses were occupied by our troops. In this remarkable manner the army and the navy co-operated, and in 7 hours this enormous work, assisted by the fire of the fleet, was captured by a handful of men. Seventy-five guns were captured, and 2500 men taken prisoners, among them Gens. Whiting and Lamb, who were wounded. Porter, his officers, and men received the thanks of Congress. Twenty-four hours after the fall of Fort Fisher, Fort Caswell, Baldhead Fort, and Fort Shaw were evacuated. Fort Campbell was abandoned a few hours later, and this entire chain of rebel defenses fell into our hands. About the 15th February the combined forces resumed operations against Wilmington. Fort Anderson, the most important work remaining to the enemy, surrendered on the 18th February, after a vigorous bombardment by the vessels of the fleet, supported by Gen. Schofield, who advanced upon the fort with 2000 men. On the 21st February the enemy were driven from Fort Strong, and on the 22d Wilmington was evacuated.

During the year 1864 a portion of the naval force attached to the North Atlantic Blockading Squadron was actively engaged in co-operating on the James River with the army of Gen. Grant. A number of sharp and severe engagements occurred between these vessels and the powerful batteries which lined the shore of the river, in many of which the navy acquired great credit, particularly in the engagement with the rebel batteries at Deep Bottom, where Commander A. C. Rhind, in the "Agawam," specially distinguished himself for "gallantry and endurance," and received the thanks of the Navy Department.

South Atlantic Blockading Squadron.—In October, 1861, a joint naval and military expedition was organized, the object being to seize and occupy points on the Southern coast as places of supply and to afford protection to loyal citizens. Flag-Officer S F. Dupont was appointed the naval commander, and Gen. W. T. Sherman to the command of the military forces. Port Royal, S. C., was selected as the first objective-point. On the 29th of October the fleet, consisting of 48 vessels, including transports, sailed from Hampton Roads. Off Hatteras the severest storm known for many years was encountered, in which the steamer "Governor," having on board the battalion of marines, was lost, and also the transport steamer "Peerless." The crew and marines of the former were rescued by Capt. Cadwallader Ringgold in the "Sabine," and the crew, etc., of the latter were saved by Commander S. Godon in the "Mohican." On the morning of the 4th of November the rest of the fleet anchored off the bar of Port Royal. The buoys, etc., having been removed, Commander C. H. Davis and Mr. Boutelle, of the coast survey,

sounded out the channel and buoyed it. The "Ottawa," Lieut. Commanding T. H. Stevens; "Seneca," Lieut. Commanding D. Ammen; "Pembina," Lieut. Commanding J. P. Bankhead; "Pawnee," Lieut. Commanding B. H. Wyman; and "Curlew," Lieut. Commanding P. G. Watmough, were sent forward to cover the transports, which crossed the bar and anchored in the lower anchorage of Port Royal. The enemy's fleet under Tatnall shortly after steamed down the harbor, when the gunboats got under way and chased them under the forts. The next morning Gen. Wright and Commander John Rodgers, in the "Ottawa," supported by the other gunboats, made a reconnoissance and drew the fire of the forts on Bay Point and Hilton Head sufficient to show them to be works of strength and well constructed. A fleet of 7 of the enemy's vessels, armed with rifle-guns, occupied the inner portion of the harbor. Preparations for the attack were immediately made. The order of battle comprised a main squadron in line ahead and a flanking squadron to engage the enemy's flotilla and cover the rear of the main line as the ships swung to the southward. The main squadron consisted of the "Wabash," Commander C. R. P. Rodgers; the "Susquehannah," Capt. J. L. Lardner; "Mohican," Commander S. W. Godon; "Seminole," Commander J. P. Gillis; "Pawnee," Lieut. Commanding R. H. Wyman; and gunboats "Unadilla," Lieut. Commanding N. Collins; "Ottawa," Lieut. Commanding T. H. Stevens; "Pembina," Lieut. Commanding J. P. Bankhead; sailing sloop-of-war "Vandalia," Commander F. S. Haggert, towed by the "Isaac Smith," Lieut. Commanding J. W. A. Nicholson; and the steamer "Augusta," Commander E. G. Parrott. The flanking squadron consisted of the steamer "Bienville," Commander Charles Steedman; the gunboats "Seneca," Lieut. Commanding D. Ammen; the gunboat "Curlew," Lieut.-Commander P. G. Watmough; "Penguin," Lieut. Commanding T. A. Budd; and the steamer "Augusta," E. G. Parrott. The plan of attack was to pass midway between the forts, engaging both batteries to a point about 2½ miles beyond; then to turn to the southward round by the west, and after passing Hilton Head to turn to the northward by the east. These evolutions were to be repeated. Three times the larger vessels of the fleet circled between the forts, while the gunboats "Ottawa," "Seneca," "Pembina," and "Curlew" took up an enfilading position after passing between the forts, and poured in a destructive fire upon the Hilton Head fort, which was very effective. The engagement lasted three hours, when the enemy deserted the Hilton Head defenses. With the fall of these works the fort on Bay Point was also abandoned. Flag-Officer Dupont, his officers, and men received the thanks of Congress. In the latter part of November Tybee Island, at the mouth of the Savannah River, was occupied without opposition. At about the same time naval reconnoissances were made by Commander Drayton in St. Helena Sound, and in the Coosa and Ashepoo and the North and South Edisto Rivers. He found the works erected by the enemy abandoned. St. Helena Island was occupied by the navy. Similar reconnoissances were made in Warsaw and Ossibaw Sounds, with like results, excepting on the eastern end of Green Island a battery was found erected of 8 guns. In the latter part of December, Gen. Sherman having requested the co-operation of the navy to arrest the designs of the enemy, who were attempting to shut up our forces on Port Royal Island by obstructing the Coosa and Whale Back Rivers and by erecting batteries at Port Royal Ferry, Seabrooke, and Boyd's Neck, where the enemy had concentrated a force of 3000 men, Commander C. R. P. Rodgers was appointed to command the naval forces, which consisted of the "Ottawa," "Seneca," "Pembina," "Ellen," and "C. B. Hale." The attack was made on the 1st of January, 1862, and the movement was entirely successful. Gen. Isaac Stevens, who commanded the military forces, rendered the most cordial thanks for the hearty co-operation and assistance of the navy.

On the 1st of February, an expedition under command of Commander C. H. Davis, consisting of the "Ottawa," "Seneca," "Isaac Smith," "Potomska," Lieut. Commanding P. G. Watmouth, "Ellen," and "Western World," with 3 army transports, having on board 2400 troops, under command of Gen. H. G. Wright, sailed from Port Royal to make a reconnoissance of the Little Tybee River and adjacent streams. Commander C. R. P. Rodgers, with 2 armed launches of the "Wabash," accompanied the expedition. On the 2d the vessels entered the Little Tybee, and after passing Fort Pulaski without being fired upon, proceeded to a point beyond the high lands on Wilmington Island. Here a row of piles were placed, and the vessels anchored. Scouting-parties were sent out in all directions without seeing anything of the enemy, and Lieut. Commanding Ammen landed and cut the telegraph-wire between Fort Pulaski and Savannah. About noon 5 steamers of the enemy, under command of Tatnall, having scows in tow, attempted to pass down the Savannah River, but were driven back by the fire of the gunboats. At night-fall the expedition got under way, to the regret and disappointment of most connected with it, and returned to Port Royal. Nothing but a few rotten piles and rusty guns many believed stopped the way to Savannah in that direction. Commander Davis was a strict constructionist of orders, and, however promising of success, did not feel justified in making the attempt. On the last of February, 1862, Flag-Officer Dupont left Port Royal with most of his squadron and several transports, having on board a brigade of troops under Gen. Wright, for the purpose of attacking Fort Clinch. On the 2d of March, when off St. Andrews, the entrance to Cumberland Sound, all the light-draft vessels were directed to proceed through the sound for the purpose of attacking the fort in that direction, while the heavy vessels were to proceed outside and attack from that quarter. In passing through the narrow and difficult inside passage one after another of the vessels grounded; and the "Ottawa," Lieut. Commanding Stevens, alone succeeded in getting through. When within about 3 miles of the fort, Commanders Drayton and C. R. P. Rodgers came on board that vessel. It being the impression that the enemy were about to abandon the fort, the "Ottawa" proceeded at full speed to cut off the retreat of the enemy and to prevent the destruction

of property. In passing Fort Clinch, Lieut. G. B. White, the executive of the "Ottawa," was sent in the gig to hoist the American flag over the first national fort retaken from the rebels. While passing up to the draw of the railroad bridge, a train of cars was descried leaving Fernandina, to which the "Ottawa" gave chase, and disabled by a shot from her pivot-gun. The steamer "Darlington" also attempted to escape, but was brought to by a well-directed shot from the "Ottawa," when Commander Rodgers, of the "Wabash," who had brought to that vessel two of his armed launches, boarded the "Darlington" and took possession. A pilot-boat was also captured, and all the guns, munitions of war, stores, etc., belonging to the fort. That night the "Ottawa" proceeded up the river to the town of St. Mary's, which Commander Rodgers took possession of about midnight, capturing the horses and accoutrements of a cavalry guard, which, so sudden was the surprise, the enemy did not find time to mount. The next morning, learning that 2 steamers had escaped up the river, Lieut. Commanding Stevens pushed on in pursuit, going as far as Woodstock Mills, a point 50 miles above St. Mary's. On the return of the "Ottawa," she was heavily attacked from both sides of the crooked river, not 100 yards wide, by a large body of the enemy. The firing was kept up for a distance of about 2 miles, and was so severe as to drive our men from all the guns but the howitzers, which were well served, and from the effects of which the enemy must have suffered severely. Scarcely a person on board the "Ottawa" escaped untouched in clothing or person. On the 7th of March, Commander Godon, in the "Mohican," having with him the "Potomska" and "Pocahontas," took possession of Brunswick, Ga. About the same time an expedition was organized under Lieut. Commanding Stevens, to make a reconnoissance of the St. John's River as far as Jacksonville, Fla. The expedition comprised the "Ottawa," "Seneca," Ammen, "Pembina," Bankhead, "Isaac Smith," Nicholson, and "Ellen," and about 1000 troops. About 10 o'clock in the evening of the day the vessels crossed the shallow and difficult bar at the mouth of the river large fires were discovered in the direction of Jacksonville, which proved to be the burning of saw-mills, the property of men with Union proclivities, and a gunboat on the stocks was also destroyed. The expedition was entirely successful. The batteries at the mouth of the river were abandoned, and also a fort on St. John's Bluff, and their guns secured. Upon approaching Jacksonville, a boat bearing a flag of truce came alongside of the "Ottawa" to surrender the city, which was taken possession of without opposition. Penetrating into Dunn's Creek, Lieut. Stevens found the famed yacht "America," which had been sunk by the enemy. She was raised and taken to Port Royal. It is understood she had been purchased by the Confederacy for $60,000 in gold, for the purpose of taking their commissioners, Slidell and Mason, to Europe. On the 12th of May, Commander C. R. Rodgers received the surrender of St. Augustine, Fla. The results of these various expeditions gave us possession of the coast and inland waters from St. Simon's southward. Upon the information derived from Robert Small, a colored pilot, who had made a daring escape from Charleston, Stone River and inlet were occupied. In March, Lieut. Commanding Budd and Acting Master Mather, and others, were ambushed and killed while engaged on a boat expedition into Mosquito Inlet. After a bombardment of 2 days, Fort Pulaski surrendered on the 12th of April. Commander C. R. P. Rodgers, upon this occasion, represented the navy in command of Battery Siegel, officered and manned by a detachment from the "Wabash." On the 26th of January, 1863, Commander J. L. Worden, in the monitor "Montauk," engaged for 4 hours the enemy's battery at Genesis Point, on the Great Ogeechee River. On the 30th of January, the Confederate rams raided the blockading fleet off Charleston, disabling the "Mercedita" by a shot which exploded her boiler and scalded many of her crew, and by the explosion of a shell set the "Keystone State" on fire. Le Roy, who commanded the latter vessel, hauled off to extinguish the fire, which done, he ordered a full head of steam with the intention of running down one of the ironclads. In the act of running for her with a speed of 12 knots, a shot struck her steam-chest and disabled the vessel. In the mean time, Parrot in the "Augusta," Fraley in the "Quaker City," and Watmough in the "Memphis," kept up a steady fire upon the enemy, in which they were shortly joined by the "Housatonic," Taylor, when the enemy soon withdrew. The "Keystone State" lost about a fourth of her crew in killed and wounded. On the 30th of January the steamer "Isaac Smith," having grounded in Stono River under the fire of a heavy battery, after a gallant resistance, was captured. At daylight on the 27th of February, Commander Worden, in the monitor "Montauk," accompanied by the gunboats "Seneca," Gibson, "Wissahickon," Davis, and "Dawn," shoved up under a heavy fire from Fort McAllister, and destroyed the enemy's armed steamer "Nashville," lying under the fort, by a well-directed shot from the "Montauk," which exploded her magazine. Government having determined to attempt the capture of Charleston, a force consisting of the ironclad "New Ironsides," Turner, accompanied by the monitors "Passaic," Drayton, "Weehawken," John Rodgers, "Montauk," Worden, "Patapsco," Ammen, "Catskill," George W. Rodgers, "Nantucket," Fairfax, "Nahant," Downes, and "Keokuk," Rhind, crossed the bar off Charleston, on the 6th of April, and anchored outside. At noon the next day the vessels moved to the attack. The plan of attack contemplated passing by Fort Sumter without stopping to engage any of the supporting batteries, which fort was to be attacked on the northwest front. The heavy fire of these batteries, together with the nature of the obstructions, defeated this intention, and the fleet were compelled to make the attack from the outside, on the sea front of the fort. The attack was a failure. Several of the monitors were reported partially disabled, and the "Keokuk," whose chivalrous commander had carried her almost under the walls of Fort Sumter, was so badly cut up that she sank the next morning. On the 17th of June the enemy's ironclad "Atlanta" was captured, after a brief engagement of 15 minutes, by the monitor "Weehawken," John Rodgers, and taken possession

of by a boat from the "Montauk," Downes. The action was so brief the "Nahant" did not have an opportunity to fire, and the "Weehawken" fired but 5 shots. On the 6th day of July, Rear-Admiral Dupont was relieved at his own request by Rear-Admiral Dahlgren, in command of the squadron. On the 18th of July a combined attack was made upon Fort Wagner by the troops and ironclads. The fort was engaged at short range by the latter, and silenced for the day, but the troops were repulsed, owing to the inadequacy of the force. On the 17th of August the land batteries opened upon Sumter, in which the "Patapsco" and "Passaic" joined, while the "Ironsides" and the other monitors engaged Wagner. Forts Sumter and Wagner were silenced. During this engagement the gifted and gallant George W. Rodgers, in command of the "Catskill," was killed, and also Paymaster Woodbury, who was standing by his side. On the 22d of August, Commander T. H. Stevens, in the "Patapsco," and Commander E. Ross Colhoun, in the "Weehawken," engaged Fort Wagner for about 2 hours. About this time several changes occurred, Commander Rodgers having been killed, and Fairfax and Downes relieved at their own request. Commander Bryson was ordered to the command of the "Lehigh," Lieut. Commanding John Lee Davis to that of the "Montauk," Lieut. Commanding Cilley to that of the "Catskill," and Cornwell to that of the "Nahant." On the 23d of August the "Ironsides" and all the monitors bombarded Sumter for about 4 hours at a distance of 800 yards under a very heavy cross-fire from the enemy's defenses. On the 31st of August a division of monitors under Commander T. H. Stevens, embracing the "Patapsco," "Weehawken," "Passaic," and "Nahant," attacked Fort Moultrie and the adjacent batteries for about 3½ hours, when signal was made to withdraw. Some of the monitors were heavily hit. Simpson, commanding the "Passaic," in his work on "Armored Vessels," refers to this engagement as the severest that had occurred between land batteries and ironclads. On the night of the next day another demonstration, participated in by the "New Ironsides" and all the monitors, was made upon Sumter, which lasted for about 4 hours under a heavy cross-fire from the enemy's batteries, considerable damage being done to some of the monitors. On the night of the 6th, under the combined operations of the army and navy, Forts Gregg and Wagner fell, and Morris Island was evacuated by the enemy.

At 5.30 P.M. of the 7th the "Ironsides" and all the monitors, with the exception of the "Weehawken" (aground), got under way to attack the enemy's defenses on Sullivan Island. The object of the demonstration was to cover the "Patapsco" while she proceeded to make an examination of the obstructions. When the enemy discovered the object of the movement, all the batteries upon Sullivan Island opened upon the "Patapsco." Under this terrific fire she was struck 23 times in as many minutes. She proceeded to within 150 yards of Fort Sumter and the obstructions, and having made the required examination, dropped down to the flag-ship, when Commander Stevens went on board to report. On the morning of the 8th September, the "New Ironsides" and all the monitors, under command of Commodore Rowan, got under way and anchored within 800 yards of the batteries on Sullivan Island to cover the "Weehawken," still aground. The engagement, lasting 3 hours, was very severe, during the close of which the "Patapsco" was disabled and towed to her anchorage. Admiral Dahlgren, having the impression that there was nothing but a corporal's guard in Sumter, sent, on the night of the same day, an expedition composed of 400 men and officers in 40 boats, under Commander Stevens, to surprise the fort. On nearing Sumter the boats were hailed, and simultaneously a rocket was sent up from the northeast bastion, when all the batteries on James and Sullivan Islands, and an ironclad with grape and canister, opened upon the attacking party, and the solitary approach to the fort—the parapets—being lined with sharpshooters, the boats were being rapidly sunk by hand-grenades and heavy stones; those who had landed could not get back through the terrific tempest of shot and shell, grape and canister and musketry, nor could relief be rendered them, and as a further persistence in the attack would have been madness, the order was given to fall back. About a fourth of the command was killed or taken prisoners; among the latter the gallant Porter, Preston, and Williams, who were among the first to land. Gen. Beauregard, who commanded the defenses in Charleston harbor, writes: "If we had not opened so soon and fired so rapidly we would have captured or destroyed your whole command." The enemy were enabled to read all our signals, and as the preparations, imperfect as they were, were made in open day, the enemy were fully prepared—as Gen. Beauregard states and the sequel shows—to repel the assault. Just outside of the line of fire lay a number of army-boats loaded with men ready to participate had the movement been a success, which retired without making a single demonstration. For about 10 days in November the monitors "Patapsco" and "Lehigh" co-operated with the army in bombarding Sumter until it was reduced apparently to ruin; but no subsequent attempts were made to occupy it until Charleston was flanked by Sherman, when all its defenses were abandoned. In February, 1864, a division of gunboats was sent to the St. John's River to co-operate with the army in a movement into Florida. On the night of the 17th February, 1864, the sloop-of-war "Housatonic" was sunk off Charleston by a torpedo-boat. Other similar but fruitless attempts were made upon our vessels. In February, Admiral Dahlgren having received a leave, Commodore Rowan was left temporarily in command. In March a diversion was made into Bull's Bay. In May a force was detailed to co-operate with the army in an effort to sever the railroad between Charleston and Savannah. Information having been received of Sherman's advance to the sea, at the proper time every available means were used to aid in the success of the movement by creating diversions in various directions and to embarrass the enemy. On the 12th December Sherman arrived in the neighborhood of Savannah, when Dahlgren immediately opened communication with him. On the 18th December the investment of that city by the army on one side and the navy on the other was accomplished. Savannah was occupied by Sherman on the 21st. Early in January,

1865, the forces under Dahlgren assisted in transferring the right wing of Sherman's army to Beaufort, S. C. On the 12th and 13th February a joint army and navy movement was made along the approaches from Bull's Bay to Mount Pleasant with a view to threaten Charleston, which was evacuated on the night of the 17th, and Georgetown was soon after occupied by the navy. Rear-Admiral Dahlgren received the thanks of the Department for his untiring energy, etc., while in command.

East Gulf Blockading Squadron.—This squadron embraced within its limits the coast of Florida from Cape Florida to Pensacola. In January, 1862, Flag-Officer McKean, then in command, dispatched Commander Emmons in the "Hatteras" to operate against the enemy at Cedar Keys. The expedition destroyed a large amount of public property, including military stores, and captured several loaded schooners ready to run the blockade, and a battery of 2 guns in position at Sea-Horse Key. In the latter part of March, Commander Stellwagen, in the "Mercedita," arrived off Appalachicola with the "Sangamon," Lieut. Commanding Drake, and organized a boat expedition for the capture of a number of vessels above the city. No resistance was offered, and the expedition brought out a number of vessels and destroyed others. On the 4th of April, Lieut. Commanding Cate, in the "Pursuit," captured at St. Andrews a valuable side-wheel steamer of 500 tons with 200 bales of cotton. During the year 1863, the squadron, being then under command of Rear-Admiral T. Bailey, captured or destroyed more than 300 blockade-runners. In May, an expedition of several hundred, led by Confederate naval officers, made an attempt to capture, off Appalachicola, the U. S. steamer "Adela," which resulted in their complete discomfiture, the capture of most of them with several boats, their armaments and accoutrements. During the year many armed incursions were made into the interior of Florida, which resulted in the destruction of a number of salt-works. During the year 1864 the East Gulf Blockading Squadron engaged in no active operations against the enemy.

West Gulf Blockading Squadron.—On the night of the 12th April, 1861, Fort Pickens was reinforced by a party of U. S. troops under Capt. Vogdes, and by the marines of the squadron under Lieut. Cash. The "Brooklyn," Capt. Walker, and the "Wyandotte," Lieut. Commanding Mullany, were engaged in landing them. On the night of September 13, 1861, an expedition was fitted out, consisting of the first launch, and the first, second, and third cutters of the "Colorado," under the command of Lieuts. Russell, Sproston, and Blake, and Midshipman Steece, accompanied by Capt. Reynolds, of the marines, Assistant Surgeon Kennedy, Assistant Engineer White, and Midshipmen Forrest and Higginson. The entire force numbered about 100, including officers, sailors, and marines. The object of the expedition was the destruction of a schooner lying off the Pensacola Navy-Yard intended to be fitted out as a privateer, and the spiking of a gun in the southeast end of the yard. A desperate resistance was made, but the objects of the expedition were gallantly accomplished, the vessel was destroyed and the gun spiked. Our loss was 3 killed. Midshipman Higginson had the end of his thumb shot off, and Capt. Reynolds received a severe contusion in the shoulder. Handsome acknowledgments were made to those participating in this dashing enterprise. On the night of the 7th November, an expedition consisting of the first and second launches of the "Santee," under the command of Lieut. James E. Jouett, having with him Lieut. J. J. Mitchell, Acting Gunner William Carter, and Acting Master's Mate C. W. Adams, with 2 armed boats, left the "Santee," then blockading off Galveston, Texas, for the purpose of destroying the armed steamer "General Rusk," lying under Pelican Island fort. The armed schooner guarding the channel, and Bolivar and Pelican Island forts, were successfully passed without discovery, but the boats having grounded on Bolivar Spit, were discovered. Lieut. Jouett deeming it imprudent after being discovered to make an attempt upon a vessel so heavily armed as the "Rusk," concluded to abandon that portion of the expedition. In returning he boarded and, after a sharp and severe contest, in the commencement of which he was severely wounded, captured the schooner "Royal Yacht," armed with a light 32-pounder. Thirteen prisoners were captured, several stands of arms, and the colors. As the pilot of the expedition had been shot down, and the schooner had received a shot between wind and water, Lieut. Jouett concluded to burn her. After this the party returned to the frigate. Lieut. Jouett and Gunner Carter were seriously wounded, as were also 6 men, 2 of them mortally. Flag-Officer McKean issued a general order thanking the officers and men who composed the expedition, expressing the conviction "that their names would be enrolled by a grateful country among those who in former years have shed so bright a lustre upon the American navy." Jouett's intrepid conduct, and his indomitable will and courage, which, overcoming all obstacles, carried the enterprise to a successful conclusion, were acknowledged by the Department in his immediate appointment to an important command, and in a letter from the Department to Flag Officer McKean, which says, "The Department cannot in too high terms express its admiration of the daring and successful exploit of Lieut. Jouett, and the officers and men under him. The capture of a schooner well armed, and with every advantage of resistance, after a desperate encounter, speaks well of the intrepidity and bravery of the captors." On the 25th May, 1862, Lieut. Commanding Abner Read, in the "New London," had a spirited engagement off Pass Christian with the "Oregon" and "Pimlico," two of the enemy's armed vessels, which lasted 2½ hours, when they retired.

Capt. D. G. Farragut having been appointed to the command of the West Gulf Blockading Squadron, and charged with the reduction of the defenses guarding the approaches to New Orleans and the capture of that city, arrived at Ship Island on the 21st February, 1862, and at once commenced active preparations for that purpose. Eighteen thousand troops under Gen. B. F. Butler were to co-operate, and a fleet of mortar-vessels and armed steamers under Commander David D. Porter were to take part in the operations. The squadron for the purpose had been largely increased by many of the largest frigates

and sloops-of-war in the navy. Much difficulty was experienced in getting some of the former over the bar, and with the "Colorado" it was found impossible. On the 16th March, Porter with his mortar fleet, assisted by the gunboats, commenced the bombardment of Fort Jackson. On the 1st April, Capt. Bell, assisted by Lieuts. Caldwell and Crosby, who had been selected for the purpose, succeeded in cutting the chain placed in the river to obstruct our vessels. At 2 o'clock A.M., all preparations for the attack having been completed, signal was made to get under way. Owing to some difficulty with the "Pensacola" and some of the other vessels in getting their anchors, they were not under way for an hour later. The vessels then advanced in two columns, Capt. Bailey leading the right and the advance in the gunboat "Cayuga," Lieut. Commanding N. B. Harrison, followed by the "Oneida," Commander S. P. Lee; "Varuna," Commander C. S. Boggs; "Katahdin," Lieut. Commanding G. H. Preble; "Kineo," Lieut. Commanding Geo. M. Ransom; and "Wissahickon," Lieut. Commanding Albert Smith, supported by the steam-sloop "Pensacola," Capt. H. W. Morris, and frigate "Mississippi," Commander M. Smith. This division was to attack Fort St. Philip. The second division of the column was led by the "Hartford" (flag-ship), Commander Richard Wainwright, followed by the "Brooklyn," Capt. Thomas T. Craven; the "Richmond," Commander James Alden; and the second division of gunboats led by Capt. H. H. Bell in the "Sciota," Lieut. Commanding Edward Donaldson, followed by the "Iroquois," Commander John DeCamp; "Kennebec," Lieut. Commanding John H. Russell; "Pinola," Lieut. Commanding Pierce Crosby; "Itasca," Lieut. Commanding C. H. B. Caldwell; and "Winona," Lieut. Commanding E. T. Nichols, in the order named. The fleet soon passed the barrier chains, the right division attacking Fort St. Philip, and the left Fort Jackson. Commander Porter had by previous arrangement moved up to a certain point on the Fort Jackson side with his gunboats, while his mortar-vessels, with the "Portsmouth," engaged the water-batteries to the southward and eastward of Fort Jackson, and poured in a terrific fire of shells. A fire-raft was started down upon the "Hartford," in avoiding which the ship grounded, when the enemy's ram "Manassas" appeared, and pushed the raft down upon the "Hartford," setting her on fire half-way up to her tops. She was soon backed off and the fire extinguished. In the mean time, Fort St. Philip was soon silenced by the fire of the "Hartford." By the time the enemy's gunboats, reported to be 13 in number, besides the ironclads "Manassas" and "Louisiana," appeared, they were taken in hand and most of them destroyed. The fleet, with the exception of the "Winona" and "Kennebec," which were unable to pass the forts before the day broke, was now fairly past the forts, and the victory won. The "Varuna," which was some distance in advance of most of the fleet, was sunk. Just at the close of the fight the ram "Manassas" made a demonstration upon the "Hartford," when the "Mississippi" made after her, drove her ashore, and, pouring two broadsides into her, left her a perfect wreck. This closed the morning's fight. Capt. Bailey proceeded on and captured the Chalmette regiment. The fleet reached the English turn about 10 A.M. of the 15th. It was now formed in two columns as before. As Capt. Bailey in the advance approached the Chalmette batteries they opened a galling fire, but the larger vessels coming to his assistance opened, when the batteries were silenced and the troops driven out. New Orleans was shortly after taken possession of by Capt. Bailey, all the steamboats seized and sent down the river to bring up Gen. Butler's forces. Farragut then pushed on to Carrollton, where there were two other forts, which were found deserted. On the 28th April, Forts Jackson and Philip, after a bombardment of 144 consecutive hours by Porter's mortar fleet, surrendered to that officer. On the 29th, Gen. Butler reached New Orleans, and shortly after his troops were in full possession of the city. A detachment of smaller vessels, under Commander S. P. Lee, was sent as high as Vicksburg. Farragut, and Porter and his command, received the thanks of Congress. May 7, Commander James Palmer, in the "Iroquois," took possession of Baton Rouge with all the public property. On the 28th June the mortar-vessels commenced the bombardment of the Vicksburg batteries, which were soon silenced by this fire and that of the squadrons, but as there was not a sufficient land force to co-operate, the enemy soon returned to their guns. On the 2d July, Flag-Officer Davis, commanding the Mississippi Flotilla, joined Farragut above Vicksburg with a force of gunboats and mortar-vessels. On the 15th the enemy's ram "Arkansas" ran past the fleet and took refuge under the guns of Vicksburg. An unsuccessful attempt was made to destroy her. While the ironclad "Essex," Commander William Porter, and the gunboats "Kineo," "Katahdin," and "Sumter," were lying off Baton Rouge, a vigorous attack was made by the enemy on Gen. Williams's command, occupying that place, and the recapture attempted by a largely superior force led by Gen. Breckenridge, but were repulsed by the fire of the gunboats. The next morning, Commander Wm. Porter, in the "Essex," encountered the "Arkansas" a short distance above Baton Rouge, and after a short engagement the "Arkansas" was abandoned and blown up. The middle of September, Corpus Christi was occupied. Shortly after, Acting Master Francis Crocker, in the "Kensington," captured and took possession of the defenses of Sabine City. On the 4th of October, Commander W. B. Renshaw, of the "Westfield," having with him the "Harriet Lane," "Owasco," and "Clifton," after a feeble resistance, captured the city of Galveston and its defenses. On New Year's day, 1863, the gunboats holding the city were attacked by 4 of the enemy's vessels. The "Harriet Lane," after a desperate resistance, was carried by boarding. Wainwright, her gallant commander, was killed, and his executive, Lieut.-Commander Lee, mortally wounded. The "Westfield," in coming to her assistance, grounded, and, to prevent capture, Commander Renshaw blew her up,—that officer, Lieut. Zimmerman, Chief Engineer Green, and nearly a dozen men perishing with her. On the 11th of January the "Hatteras," a purchased vessel, Lieut. Blake commanding, was sunk by the enemy's steamer "Alabama," off the coast of Texas, where the "Hat-

teras" was stationed as a blockade vessel. In March, 1863, Farragut, with a strong force of vessels, attempted the passage of the Port Hudson batteries, but only the "Hartford" and "Albatross" succeeded. With them he approached Vicksburg, and opened communication with Rear-Admiral D. D. Porter, commanding the Mississippi Squadron, and Gen. Grant, both of whom were operating against that place. In attempting to pass Port Hudson the steamer "Mississippi" grounded and was destroyed. Upon this occasion the gallant and promising Cummings was killed. The navy now held control of the river between Vicksburg and Port Hudson, and, by establishing a blockade of the Red River, cut off the supplies from Texas destined to the use of the enemy. A naval force was always kept ready to co-operate with the army in the reduction of Port Hudson, and a continuous shelling of the place from mortar-boats, vessels, and a naval battery on shore was maintained. Nearly three thousand 13-inch shells were thrown into the works by the mortar-vessels, and the naval battery of 9-inch guns, used as a breaching battery, did good work. With the fall of Vicksburg, Port Hudson surrendered on the 9th of July. Military co-operation having been secured early in July, and 2 ironclads from the Mississippi and 2 from the James River having arrived, Farragut made his final preparations for the attack on the defenses of Mobile Bay. The ironclad "Tecumseh" arrived on the evening of the 4th of August, and everything being propitious, the attack commenced on the following morning. At 5.40 A.M. of the 5th of August the fleet moved in the following order, 2 abreast, and lashed together: "Brooklyn," Capt. James Alden, with the "Octorara," Lieut.-Commander C. H. Green, on the port side; flag-ship "Hartford," Capt. Percival Drayton, with the "Metacomet," Lieut.-Commander James E. Jouett; "Richmond," Capt. T. A. Jenkins, with the "Port Royal," Lieut.-Commander B. Gherardi; "Lackawanna," Capt. J. B. Marchand, with the "Seminole," Commander Edward Donaldson; "Monongahela," Commander James H. Strong, with the "Itasco," Lieut. Commanding George Brown; "Oneida," Commander J. A. Mullany, with the "Galena," Lieut.-Commander Clark H. Wells. The ironclad "Tecumseh," Commander T. M. Craven; the "Winnebago," Commander T. H. Stevens; the "Manhattan," Commander J. W. A. Nicholson; and the "Chickasaw," Lieut.-Commander G. H. Perkins, were under Sand Island, and had been ordered to take position on the starboard side of the wooden vessels, or between them and Fort Morgan, to keep down the fire of the water-battery, and to attack the ram "Tennessee" when the fort was passed. As the attacking vessels, in order of battle, moved steadily up the main channel and neared Sand Island, the monitors weighed anchor and took up their assigned positions. At 6.47 A.M. of the 5th of August the "Tecumseh," the leading monitor, fired the first shot. At 7.06 the fort opened upon the fleet, when the action became general, the vessels firing as their guns could be brought to bear. The leading vessel, the "Brooklyn," had barely passed Fort Morgan when the "Tecumseh" struck a submarine torpedo and sunk instantaneously, carrying down her commander, the noble Craven, and most of her officers and crew. A boat dispatched from the "Metacomet," Capt. Jouett, rescued 12 of the survivors, who were brought on board the monitor "Winnebago," within 200 yards of the fort. Mr. Nields, a volunteer officer in charge of the boat, won distinction and honor by the gallantry he displayed upon this occasion. With the sinking of the "Tecumseh" the "Brooklyn," the leading vessel, stopped, and in doing so without notice threw the wooden vessels out of line and into a confused and helpless condition, which the enemy took advantage of, and poured in a destructive fire from the forts and vessels, to which the monitors alone were enabled to reply. Farragut at once comprehended the situation, and when Alden reported a heavy line of torpedoes ahead, the quick response came, "Damn the torpedoes! Four bells,—go ahead, Capt. Drayton." And responsive to the will of her master, the grand old "Hartford" dashed by the "Brooklyn," straightened out the line, restored the fortunes of the day, and swept proudly on to victory. A little after 8 o'clock, Buchanan, in the ram "Tennessee," made a dash at the "Hartford," who took no other notice of her than to pour in a broadside. In the mean time the enemy's gunboats (particularly the "Selma") lying athwart the channel poured in a raking fire upon the advancing vessels, and inflicted considerable damage. Jouett was ordered to cast off and go in pursuit; he was after her in a moment, and in an hour's time had her as a prize. The "Morgan" and "Gaines" escaped under the guns of Fort Morgan,—the latter so badly injured that she sunk shortly after. During the night the "Morgan," chased and fired upon by the "Winnebago," escaped to Mobile. At 8.45, as the vessels were about to anchor, the ram "Tennessee" was perceived making for the fleet. The vessels most adapted to the purpose, with the monitors, were ordered to attack her, not only with their guns, but to run her down. The "Monongahela," Strong, was the first vessel that struck her, without doing much injury; the "Lackawanna," Marchand, going at full speed, also struck her, the only effect being to give her a heavy list; the "Hartford" struck her a glancing blow, pouring in at the same time, within 10 feet of her casemates, a broadside of 9-inch solid shot; the monitors delivered their fire as opportunity offered. Immediately after the collision with the flag-ship, Drayton, in the "Hartford," was directed to bear down for the ram again, and was doing so at full speed when the "Lackawanna" ran into the "Hartford" and cut her down to within 2 feet of her water-line. Just at this time the ram was sorely beset; the "Chickasaw" was pounding away under her stern, the "Manhattan," not far distant, and the "Ossipee" and "Winnebago" near at hand, approaching at full speed, while the "Monongahela," "Lackawanna," and "Hartford" were bearing down determined upon her destruction, when she hauled down her colors, ran up the white flag, and surrendered. In coming out to attack the fleet the ram made for the "Oneida," when the interposition of the "Winnebago" compelled her to sheer off.

On the following day the "Chickasaw," Perkins, shelled Fort Gaines with such effect that Col. Anderson, the commanding officer, capitulated. On the 22d August a bombardment was opened

from the shore batteries, the monitors, and one or two of the wooden vessels upon Fort Morgan, which unconditionally surrendered to the navy and army on the 23d. Fort Powell was abandoned on the night of the 5th and blown up. The capture of these forts closed the port against all illicit trade with the enemy. Indications that the enemy were about to evacuate the city led to a naval reconnoissance, consisting of 4 monitors. This movement drew such a fire as to show the defenses were still intact. A joint movement by land and water was arranged between Rear-Admiral Thatcher, in command of the naval forces after Farragut's departure North, and Gen. Canby, commanding the land forces, for the capture of Mobile. The troops were landed, on the 21st March, on the left bank of Fisher's River and pushed forward, while the naval vessels shelled the woods and co-operated by signal with Gen. Canby. In crossing the bar of Blakely River the monitors "Milwaukee" and "Osage" and 4 wooden gunboats were sunk by torpedoes. Beyond this and the loss of a few lives no serious consequences attended the capture of Mobile. Fort Alexis and Spanish Fort, after a short but severe bombardment, were captured on the morning of the 9th April, and with them about 2000 men and 16 heavy guns. Batteries Tracy and Huger were evacuated on the evening of the 11th. On the 12th all the remaining defenses were found abandoned. The works which surrounded Mobile were of great strength and extent. Nearly 400 guns of the heaviest calibre fell into our hands. The city was surrendered to Admiral Thatcher and Gen. Granger. On the 10th May, Farrand surrendered all the enemy's naval forces in the waters of the Alabama. Sabine Pass and Galveston soon after surrendered, and the supremacy of the government was established on the entire coast from Maine to Texas.

Mississippi Squadron.—Commander Andrew H. Foote having been appointed to the command of the Mississippi Flotilla, the first important operation was the attack and capture of Fort Henry, on the Tennessee River. At 12.30 P.M. on the 6th February Commander Foote commenced the bombardment of the fort. The attacking force consisted of the flag-ship "Cincinnati," Commander Stemble; "Essex," Commander W. D. Porter; "Carondolet," Commander Walke; "St. Louis," Lieut. Commanding Paulding; "Conestoga," Lieut. Commanding S. L. Phelps; "Tyler," Lieut. Commanding Gwinn; and "Lexington," Lieut. Commanding Shirk. Fire was opened at 1700 yards' distance by the flag-ship, followed by the other vessels, and continued until within 600 yards of the fort. In an hour and a quarter Gen. Tilghman, in command, surrendered the fort and his forces to Flag-Officer Foote. Gen. Grant arrived about an hour afterward, when they were turned over to him. Lieut. Commanding Phelps, in the "Conestoga," with the "Tyler" and "Lexington," proceeded up the Tennessee River as far as Florence and captured the steamer "Eastport," which the enemy were converting into a gunboat, and took several other prizes. From Fort Henry Flag-Officer Foote proceeded with a portion of his command up the Cumberland to attack Fort Donelson. On the 14th February, with the ironclads "St. Louis" (flag-ship), "Carondolet," "Louisville," and "Pittsburgh" and the wooden gunboats "Conestoga" and "Tyler," he engaged the fort and water-batteries. After a severe fight of an hour and a half, during which the flag-officer was seriously wounded, and when he was on the point of enfilading the fort and the enemy's fire had slackened, the "St. Louis" and "Louisville" were disabled in their steering-gear, when the vessels retired for the night. The enemy were so demoralized they could not be brought into effective action the next day, and the fort surrendered to Gen. Grant, commanding the military forces. With the "Conestoga" and "Cairo" Foote ascended the Cumberland, and on the 19th seized Clarksville and the 3 forts which defended the city and river. On the 4th March a force of gunboats convoying transports conveying troops moved upon Columbus, on the Mississippi River. When the national forces arrived the forts, of unusual strength, were found unoccupied. On the 14th, Foote, with a force of 10 ironclads and 10 mortar-boats, joined, at Columbus, by Col. Buford with 1500 troops, moved down and took possession of Hickman. The next day, arriving in the vicinity of Island No. 10, the mortar-vessels were placed in position and shelled out several encampments. A siege of 23 days followed, during which a canal was cut to admit the light transports to reach Pope with his army at New Madrid, below Island No. 10, and enable him to cross to the Tennessee shore. A formidable battery was spiked and a floating battery protecting the channel shelled out, to enable the "Carondolet" and "Pittsburgh" to run the blockade, which they did at night in a heavy thunder-storm under a terrific fire from 47 guns. Several batteries, erected to prevent Pope's command from crossing, were demolished by the 2 gunboats, and the landing was effected. This accomplished, the enemy surrendered Island No. 10 to the commander of the naval forces. One gunboat, 4 transports, immense munitions of war, and many prisoners fell into our hands by this important capture. Proceeding to Fort Pillow, Foote was joined by Pope and his army; while in the act of making a combined attack upon this fort the troops were ordered to Corinth. Flag-Officer Foote, suffering from his long-neglected wound, on the advice of the surgeons was relieved in command of the flotilla by Capt. C. H. Davis in the early part of May. On the 11th May the flotilla was attacked near Fort Pillow by 8 of the enemy's ironclad steamers, 4 of them fitted as rams. The action continued for an hour, when the enemy retreated under the guns of Fort Pillow, 3 of their gunboats having been disabled. Shortly after the ram fleet under Col. Ellet joined Davis, and on the 5th June Fort Pillow was abandoned. On the evening of the 7th the fleet anchored a mile and a half above Memphis. The next day an attack was made upon the enemy's gunboats and rams lying opposite the city. Ellet with his rams pressed into action under full steam, the gunboats in the mean time keeping up a well-directed fire. Two of the enemy's gunboats blew up, and the "Queen of the West," commanded by Col. Ellet in person, encountered the "General Lovell" and sunk her. A running fight followed, resulting in the capture or destruction of the enemy's entire fleet, except the "Van Dorn," which escaped. Memphis

was surrendered and taken military possession of by Col. Fitch.

On the 20th of July, Davis, with a part of his command and 6 mortar-boats, joined Farragut above Vicksburg, where the latter officer, with some of his squadron, had arrived a few days before. The mortar-vessels of both commands bombarded the defenses of Vicksburg for some days from both above and below. On the 18th of July, in the mouth of the Yazoo River, a severe conflict occurred between the enemy's ironclad ram "Arkansas" and the gunboats "Carondolet" and "Tyler," which resulted in the escape of the "Arkansas," which vessel succeeded in passing through the fleets of Farragut and Davis and finding refuge under the batteries of Vicksburg. In August a joint expedition up the Yazoo under Flag-Officer Davis and Gen. Curtis was successful; a battery of heavy guns and quantities of munitions of war were captured. A detachment from the squadron under Commander A. H. Kilty, with the 46th Indiana Regiment under Col. Fitch, left Memphis for White River on June 13 to form a junction with Gen. Curtis. On the morning of the 17th an attack was commenced by the gunboats on the enemy's fortifications near St. Charles, Ark., when Col. Fitch landed to assault the rear. The front battery was carried by the gunboats, and Fitch gallantly charged the second battery and carried it without loss. A shot exploded the steam-drum of the "Mound City," killing and wounding a large portion of her officers and crew. The "Tyler," Lieut. Commanding Gwinn, and "Lexington," Lieut. Commanding Shirk, of the Western Flotilla, preceded the march of the army southward on the line of the Tennessee River, and rendered service in convoying transports, clearing the banks of batteries, and in frustrating the attempts of the enemy to fortify. At Shiloh the services of these vessels were of great value in restoring the fortunes of the day. In September, 1862, Flag-Officer Davis was relieved in command by Rear-Admiral David D. Porter, who, with his characteristic energy, at once began active operations against the enemy. In the month of November, Capt. H. Walke, in the "Carondolet," commanded an expedition of ironclads and wooden gunboats up the Yazoo River, during which the ironclad "Cairo" was sunk by a torpedo. A few days after Porter arrived at the mouth of the Yazoo, and led an expedition up the river to clear the channel of torpedoes and to draw a portion of the enemy from Vicksburg to the defense of the river. By the 26th of December the river was cleared of all obstructions up to where the "Cairo" was sunk. On the 27th the expedition arrived at a bend in the river where a line of fortifications commenced, and the river was obstructed by a heavily iron-plated raft. While the boats were engaged in clearing the river the flag-ship "Benton," Lieut.-Commander Gwinn, moved up to cover them. She was struck some 30 times, and many of her crew were killed or wounded,—among the latter her commander, mortally. The other vessels handsomely supported the flag-ship, two of the guns in the fort were silenced; the enemy's works could only have been captured by a strong landing-party.

On the 4th of January, 1863, Gen. McClernand having requested the co-operation of Admiral Porter in an attack upon Arkansas Post, the "Baron de Kalb," Commander Walke; "Louisville," Lieut. Commanding Owen; and "Cincinnati," Lieut. Commanding Bache, with a number of light-draft vessels, were detailed for the purpose. Rear-Admiral Porter, in the flag-ship "Black Hawk," accompanied the expedition. After a battle of two days, Col. Dunnington, the commander of the fort, surrendered to the army and navy, yielding his sword to Admiral Porter; 17 heavy guns and a large number of troops were captured. On the day after, Commander Walke, with a force of gunboats, proceeded up White River. On the 14th the town of St. Charles was found evacuated. At Duvall's Bluff he landed a party and took possession of 2 fine 8-inch guns and about 200 stand of arms and accoutrements. At 4.30 A.M., February 2, the ram "Queen of the West," Col. Charles E. Ellet, ran the Vicksburg batteries, with orders from Porter to capture or destroy the enemy's transports between Vicksburg and Port Hudson. Col. Ellet arrived at the Red River, capturing and destroying on his way several fine transports. The "Queen of the West" then returned to the vicinity of Vicksburg. A few days later, she steamed down and entered the Red River. On the 13th of February, Lieut. Commanding George Brown, in the "Indianola," ran the batteries of Vicksburg with orders to join the "Queen of the West." Shortly after intelligence was received of the destruction of the "Queen of the West" in Red River, and that the "Indianola" had been sunk in the Mississippi. They had destroyed a large amount of the enemy's property. In March a daring and novel attempt was made by Porter to get into the rear of Vicksburg. By ascending Steel's Bayou, which is merely a ditch, he was hopeful, by cutting a way through the woods and widening the channel, he could find an entrance into the Yazoo River, and here effect his object. When Porter arrived within a short distance of Rolling Fork, he found the channel impracticable, and was forced to return. The expedition penetrated into the heart of the enemy's country before being discovered, when large quantities of cotton were destroyed. An attempt was made by Lieut.-Commander Watson Smith, with a detachment of gunboats, to secure control of the Coldwater, Tallahatchee, Yallabusha, and Yazoo Rivers, which would have opened the way to the capture of Vicksburg, as most of the enemy's supplies were received through these streams. Owing to the want of troops to co-operate the object of the expedition failed, although several steamers and 5000 bales of cotton were destroyed. The "Switzerland" and "Lancaster," in attempting to pass the Vicksburg batteries to join Farragut at Port Hudson, were both sunk, and many of their officers and crews killed or wounded. On the 16th of April, 1863, the fleet led by Porter, who had hoisted his flag on board the "Benton," ran past the Vicksburg batteries. The vessels started in the following order, 50 yards apart: "Benton," Lieut.-Commander Green; "Lafayette," Capt. Walke, with the "Gen. Price" lashed on the starboard side; "Louisville," Lieut.-Commander Owen; "Mound City," Lieut. Wilson; "Pittsburgh," Acting Volunteer Lieut. Hoel; "Carondolet,"

Acting Lieut. Murphy; and "Tuscumbia," Lieut.-Commander Shirk, with 9 army transports. Nearly all the vessels took in tow barges containing each 10,000 bushels of coal, and all passed the batteries in safety. On the 29th of April, Porter, with most of the armed vessels that had passed the batteries, bombarded for 6 hours the formidable works at Grand Gulf. At 6 P.M. the transports containing a detachment of Gen. Grant's command passed down under cover of the fire. On the 3d of May, Porter, with 4 ironclads, proceeded to Grand Gulf to attack the forts, but found them evacuated; before leaving the enemy had destroyed all the ammunition and spiked the guns. Next to Vicksburg this was the strongest position on the Mississippi. Its occupation greatly facilitated Grant's operations in reducing Vicksburg.

On the 29th April, Lieut.-Commander Breeze, with the "De Kalb," "Choctaw," and "Tyler," made a feigned attack upon Haines' Bluff in co-operation with a division of the army under Gen. Blair, to prevent the enemy from sending reinforcements to Grand Gulf. The desired effect was accomplished. In the early part of May, Porter proceeded up the Red River as far as Alexandria, which he took possession of and held until Gen. Banks arrived. On the 15th he crossed over to Yazoo River to be ready to co-operate with Gen. Grant. On the 18th, the firing in the rear of Vicksburg indicated the approach of Grant. The cannonading was kept up furiously for some time, when Porter discovered a company of artillery advancing, taking position, and driving the enemy before them. Gen. Sherman's division had come in to the left of Snyder's Bluff, and the enemy had been cut off from joining the forces in the city. The "De Kalb," "Choctaw," "Linden," "Romeo," "Petro," and "Forest Rose," under Lieut.-Commander Breeze, were sent up the Yazoo to open communication with Gen. Grant and Sherman. This they succeeded in, and in 3 hours Porter received letters from Grant, Sherman, and Steele, informing him of their successes, and asking that provisions be sent up, which was at once done. In the mean time, Walker, in the "De Kalb," pushed on to Haines' Bluff, which was found evacuated, and took possession of the guns, tents, etc., which were found in good order. The works were destroyed. Upon this being reported to Porter, he sent up a force of gunboats from below Vicksburg to fire at the hill batteries, which was kept up for 2 or 3 hours. At midnight they moved up to the town and opened upon it for an hour, and continued at intervals during the night to annoy the garrison. On the 19th, 6 mortars were placed in position, with orders to fire rapidly day and night. On the evening of the 21st, Porter received a communication from Grant stating he intended to attack the whole of the enemy's works at 10 A.M. the next day, and asking the admiral to shell the batteries from 9.30 P.M. until 10.30 A.M. The mortars were playing rapidly on the town and works all night, and the "Benton," "Mound City," and "Carondolet" went up and shelled the water-batteries and other places where troops might find rest during the night. At 7 A.M. the "Mound City" proceeded across the river and made an attack on the hill batteries opposite the canal. At 8 o'clock, Porter joined her with the "Benton," "Tuscumbia," and "Carondolet." All the vessels opened on the hill batteries, and finally silenced them. The "Benton," "Mound City," and "Carondolet" then closed with the water-batteries, leaving the "Tuscumbia"—out of repair—to keep the hill batteries from firing on the vessels after they had passed by. The water-batteries opened furiously, supported by a hill battery on the starboard beam of the vessels. The ironclads advanced to within 280 yards and returned the fire without cessation, the enemy's fire being accurate and incessant. The vessels having been engaged an hour longer than Grant requested, and all having received shots under water which could not be stopped while under way, withdrew in a cool and handsome style. After dropping back it was found the enemy had taken possession again of one of the lower hill batteries and was endeavoring to remove his guns, and had mounted a 12-pounder field-piece to fire at Gen. McArthur's troops that had landed a short time before. The "Mound City" and "Carondolet" opened fire and drove them off in a few minutes. On May 27, Porter, at the urgent request of Grant and Sherman, being led to believe the enemy had removed his guns to the land side, fitted the "Cincinnati" for the occasion by packing her with logs and hay, and sent her down to shell some works retarding the progress of the army. At 8.30 the "Cincinnati" left her anchorage and stood for the position assigned her. The enemy fired rapidly from all their guns, including those which were supposed to have been removed to the land side. The fire was very accurate, striking the "Cincinnati" almost every time, and passing entirely through her protection of iron, hay, and wood. Finding his vessel would sink, Lieut. Bache ran up stream as far as circumstances would allow, ran his vessel ashore, and succeeded in saving his wounded. She sank within range of the enemy's batteries, in about 3 fathoms' water. Her fire, until the magazine was drowned, was effective. Lieut. Bache received the thanks of the Department for his brilliant conduct on this occasion. On the night of June 19, Porter was notified by Grant he intended to open a general bombardment on the city at 4 A.M., and continue it until 10 o'clock. Commander Woodward, of the "General Price," received orders from Porter to move up with the "Mound City" and "Benton" and attack at the specified time. Lieut.-Commander Ramsay was given charge of a 100-pounder rifle, a 10-inch gun, and a 9-inch gun, fitted on scows, and placed them after midnight close to the point opposite Vicksburg protected by the bank. At the appointed time all the shore batteries opened fire, and also the guns on the scows and mortars. A little later the gunboats opened and kept up a heavy fire, advancing all the time and throwing shells into all batteries along the hills and near the city. There was no response,—the batteries were all deserted. At 10 o'clock the vessels and mortars ceased firing.

On the 4th July, Vicksburg surrendered to Gen. U. S. Grant. On the 7th June, Porter learning that a force of the enemy of about 4000 men were about to attack Milliken's Bend, where a quantity of military stores were kept, guarded by two colored regiments and part of the 29th Iowa, the "Choctaw" and "Lexington," under Lieut.-Commander Ramsay, were dispatched to protect

them. The enemy attacked before daylight. The colored troops met the onset courageously, and a company of the Iowa regiment stood their ground until they were slaughtered to a man, killing an equal number of the enemy. The fight was desperate, and the troops overpowered were driven behind a bank near the water's edge, pursued by the enemy. When the gunboats opened on the enemy with shell, grape, and canister they fled in wild confusion. Upon the fall of Vicksburg Porter received letters of congratulation from Sherman and the Navy Department, acknowledging the powerful co-operation of the navy under his command, and its great services during this memorable campaign. The fall of Vicksburg is referred to by Sherman in his terse style as a "victory won by the united navy and army of our country." Porter was made a full rear-admiral, to date from the 4th July, the day Vicksburg surrendered. On the same day Helena, Ark., was attacked by 18,000 of the enemy. Gen. Prentice, the commander, defended the place with great skill and daring, but his small force of 3500 men were fast being overwhelmed, when Pritchett, in the gunboat "Tyler," came to his relief and changed the fortunes of the day.

Shortly after this the "Baron de Kalb," "New National," Kenwood, and "Signal," under Lieut.-Commander J. G. Walker, were sent to drive out from Yazoo City the command of Gen. Johnson, who was fortifying the place with heavy guns for the purpose of making it a depot for military supplies; 5000 troops under Gen. Frank Herron accompanied them. The army and navy made a combined attack, when the enemy fled, leaving everything in possession of the United States forces but 4 of their finest steamers, which they destroyed. The army pursued the enemy, captured many prisoners, 6 heavy guns, and all their munitions of war. One vessel, formerly a gunboat, was captured by the navy. Upon this occasion the "De Kalb" was destroyed by a torpedo. A force of gunboats under Lieut.-Commander Selfridge was sent about the middle of July into Red River. Many fine steamers, used by the enemy to transport troops, were captured. While these operations were in progress, the gunboats on the Tennessee and Cumberland were actively engaged. But for the energy and activity of Pennock, the fleet-captain and commandant at Cairo, and of Lieut.-Commanders Phelps and Fitch, the divisional commanders on these rivers, Rosecrans's army would have been without provisions. In July, Morgan, the famous guerrilla, with his command crossed the river into Ohio, and, hotly pursued by Gen. Judah, endeavored to recross. Lieut.-Commander Fitch intercepted him at Buffington Island, where Morgan and his band were captured by the army and naval forces under Judah and Fitch. In November, when Porter heard of Sherman's move from Memphis for Corinth, he assembled at the mouth of the Cumberland and Tennessee a suitable force of vessels. Though the water was low, Fitch succeeded in convoying the steamers with stores, so much needed by the army. A fortunate rise enabled Phelps with his gunboats to ascend the Tennessee as far as Eastport, and a few hours after his arrival Sherman reached Iuka. With the aid of the barges the troops were ferried over in an incredibly short time by the gunboats, and Sherman was thus enabled to bring his formidable corps into action before Chattanooga. Later the transports were convoyed with provisions, and the gunboats held Eastport, thus protecting the communications until Grant ordered its evacuation and the troops sent to Columbus, where they arrived safely under convoy of a force of gunboats. On the 1st of March a force of gunboats was sent under Lieut.-Commander Ramsay up the Black and Washita Rivers. The enemy, 2000 strong, under Gen. Polignac, were driven from point to point, some extensive works destroyed, and three heavy 32-pounders captured. On the 7th of March, Porter had assembled at the mouth of the Red River a formidable fleet of ironclads and light-draft vessels. The fleet were joined at the mouth of the Red River by a portion of Sherman's army, in transports, under Gen. A. J. Smith. The joint forces moved on the 10th of March to form a junction with Gen. Banks at Alexandria. On their way some of the vessels branched off into the Atchafalaya. The enemy were driven from Simmsport and Fort De Russy, the latter being again captured, with its guns, munitions of war, and a few prisoners. Alexandria was occupied by the combined forces about the 1st of April, when they commenced to move towards Shreveport. Only a part of the naval force could proceed farther than Alexandria; but the assistance of the gunboats was so essential to success that extraordinary exertions were made to get above the falls. Grand Ecore was reached and occupied. There were indications of the usual rise in the river, and everything promised success, and 23 heavy guns had been captured since entering the river. Springfield Landing, the next point of junction, was reached at the appointed time by 6 gunboats and 20 heavy transports. Here they learned of Banks's reverse, and that he was falling back to Pleasant Hill, some distance below; Porter was thus compelled to turn back. On his return he was attacked at every assailable point, but the gunboats fought their way through, repelling at times their assailants with terrible slaughter. On reaching Grand Ecore, he found the vessels left there still detained. Instead of rising, the river had fallen. The army was preparing to move back upon Alexandria. There was little prospect of getting the vessels out, and destruction seemed inevitable. "Providence," as Porter says, "provided the man for the occasion" in Lieut.-Col. Joseph Bailey, acting engineer of the 19th Army Corps, who devised a plan for constructing a series of dams across the rocks at the falls, thus supplying a sufficient depth of water for the needed want. The dams were built, the project was a success, and the fleet was relieved from its critical situation. Rarely has the genius of man overcome such peril and difficulty. Bailey received the handsomest acknowledgments from Congress, and he was promoted for his great services. A division of vessels under Foster, while these operations were in progress, proceeded up the Washita as far as Monroe, and captured 3000 bales of Confederate cotton and destroyed much property. On the 25th of March the enemy attacked Paducah, and demanded its immediate surrender, threatening to give no quarter if refused. The gunboats "Peosta" and "Paw Paw," and Fort Hindman opened fire

upon them, and drove them back with great loss. Capt. Pennock, naval commander at Cairo, upon receiving information of the attack on Paducah, at once sent up additional vessels, and saved Columbus, Ky., and recovered Fort Pillow by his zeal and promptness in pushing forward reinforcements. On the 1st of November, Rear-Admiral S. P. Lee relieved Porter in command of the Mississippi Squadron, the latter after two years of arduous, exhaustive, and harassing service, having requested to be relieved.

In November, 1864, the light-draft vessels "Tawah," "Key West," and "Elfin," after a severe engagement of several hours with the enemy's batteries near Johnsonville, on the Tennessee, were burned to avoid capture. Lieut.-Commander Shirk, the division commander, adopted prompt measures to regain the control of the Tennessee lost through this cause, and in a few days was able to report the capture of several transports laden with the enemy's troops. On the 4th November, Gen. Hood was driven from Decatur, Ala., in which affair the gunboat "General Thomas" took a prominent part, receiving acknowledgments from Gen. Thomas for her efficient services. On the 3d December, Lieut.-Commander Fitch, commanding the tenth district of the Mississippi Squadron, defeated and drove from the Tennessee the left wing of Hood's army under Gen. Buford, with heavy loss to the enemy, including several prominent officers, and recaptured two transports. Early in December the gunboats "Vindicator" and "Prairie Bird" co-operated successfully with the army in destroying the enemy's railroad communications in Mississippi. The expedition also destroyed the bridge over the Big Black River, and captured a considerable amount of the enemy's stores.

Early in January, 1865, Admiral Lee was enabled to report to the Navy Department that Hood's army, completely demoralized, were retreating rapidly before the victorious force of Gen. Thomas. Under date of December 30, Gen. Thomas wrote a complimentary letter to Admiral Lee, in which he says, "Your co-operation on the Tennessee has contributed largely to the demoralization of Hood's army. It gives me great pleasure to tender to you, your officers, and men my hearty thanks for your cordial co-operation during the last 30 days." After the battle of Nashville, Gen. Steedman, of Thomas's army, was sent to retake Decatur. Lieut. Moreau Forrest co-operated, and the place, with the artillery there, was captured. On the 23d April, 1865, the enemy's ram "Webb" ran out of the Red River and continued on to a point 25 miles below New Orleans, where she was intercepted by the "Richmond," and run ashore and destroyed by those on board. In June, 1865, the enemy's naval forces in Red River surrendered to Lieut.-Commander Fitzhugh, of the "Ouichita."

West India Squadron.—In 1862 a force of vessels was fitted out, placed under command of Rear-Admiral Charles Wilkes, and sent to the West Indies, for the purpose of breaking up blockade-running to and from these islands; to capture the piratical steamers preying upon the commerce of the United States, and afford protection to steamers engaged in the California trade. With an insufficient force of unsuitable vessels, Admiral Wilkes, through his untiring energy, which he infused into all under his command, and by his skillful arrangements, made many valuable captures. The "Sonoma," Commander T. H. Stevens, a vessel attached to his squadron, while crossing the Bahama Banks from Cay Lobos to the Tongue of the Ocean, discovered and chased the Confederate steamer "Florida" for 34 hours through the Tongue of the Ocean, past Nassau and Northwest Providence Channel, 124 miles to sea. This was the sole instance, it is believed, during their career of destruction and devastation, in which either of these noted cruisers, the "Alabama" or "Florida," were sighted or seen outside of a harbor. While ample provisions were made by the government to establish and enforce the blockade of our extensive coast, from the Capes of Virginia to the Rio Grande, and to provide suitable vessels and means to attack and operate against the defenses of the enemy, the policy of the government in relation to the "Alabama" and "Florida," and vessels of a similar character, was one of absolute weakness. With full and timely warning of the intent of the Confederate government to depredate upon our commerce, no suitable provisions were made for its protection. Month after month, year after year went by, each day bringing intelligence of the doings of the Confederate cruisers; but no number of fast vessels were dispatched in search of them; no vessels built or purchased with speed and long-range guns as the first essentials to overhaul and destroy them. A steamer of ordinary speed was dispatched to Europe, one to Asia, and two or three in some other direction, and with these weak and spasmodic efforts the Navy Department seemed content. Admiral Wilkes, after continuing in command of the West India Squadron for about 18 months, was relieved by Rear-Admiral James L. Lardner, and shortly after the squadron was broken up.

Potomac Flotilla.—Early in 1861 a flotilla was organized and sent to the Lower Potomac to cut off communication between the enemy in Virginia and their coadjutors and sympathizers on the Maryland side, to prevent the erection of batteries on the Virginia side, and to give protection to the commerce of loyal citizens. In the heroic discharge of his duty, as previously noticed, the first commander of the flotilla—Commander James H. Ward—was killed at Matthias Point, on the 27th June, 1861. Capt. Thomas T. Craven succeeded Commander Ward, and remained in command until relieved, in the fall of 1861, by Lieut. R. H. Wyman. During the years 1864–65 Commander F. A. Parker commanded the flotilla. Upon the flotilla devolved the duty of patroling the Potomac and Rappahannock, and on all occasions the flotilla actively co-operated in the military movements. While the army was in the vicinity of Fredericksburg the services of the smaller steamers were of great value. The flotilla was disbanded on the 31st July, 1865.

Vessels on Special Service.—On the 8th November, 1861, Capt. Charles Wilkes, then in command of the "San Jacinto," while cruising in search of the privateer "Sumter," in the Bahama Channel, took from the English steamer "Trent" the Confederate ambassadors Mason and Slidell. The prisoners were retained and conveyed to Fort Warren, where they were given in

charge to Col. Dimmick, in command of that fortress. On Sunday, June 19, 1864, the "Kearsarge," Capt. John A. Winslow, after an engagement of 1½ hours, sunk the enemy's steamer "Alabama," of equal size. For particulars of this memorable engagement, see biographical notice of Capt. Winslow. Capt. Winslow was advanced a grade, and his executive, Lieut. James S. Thornton, who was the executive of Farragut's flag-ship, the "Hartford," in the passage of the forts on the Mississippi, was also advanced. His splendid and skillful handling of the "Kearsarge" in her fight with the "Alabama" deserved and received high praise. Thornton was always distinguished for high professional acquirements and dauntless courage. On the 7th October, 1864, the "Wachusett," Commander N. B. Collins, captured in the Bay of San Salvador, Brazil, the enemy's privateer "Florida." In May, 1865, after the fall of Richmond and the collapse of the Rebellion, the Spanish authorities of Cuba delivered the ironclad "Stonewall," lately a Confederate vessel, to the United States.

During the war of the Rebellion 4647 men and officers were killed. The number of vessels captured was 1149 of all kinds, including 139 small boats; the number sunk, wrecked, and otherwise destroyed was 355, including 96 boats, making a total of 1504,—amounting to $31,500,000,—much of which was British property engaged in unneutral commerce. Nearly all the captures of value were vessels built in the so-called neutral ports, and fitted out in the ports of the governments with which we had treaties and were on friendly terms, and who had pledged themselves to a strict neutrality. Three hundred and twenty-two naval officers threw up their commissions at the breaking out of the Rebellion and their places were filled by volunteer officers, many proving worthy of the trust reposed in them; and the additional want of officers required by the war was supplied from this source. The navy contained at the close of the war 51,500 seamen, and 7500 officers, of all grades; 6880 artisans, of all kinds, were employed at the different naval stations; 208 steamers were built during the war (since the 4th of March, 1861); 481 vessels were purchased, of which 313 were steamers, at a cost of $18.366,681; of these 340 have been sold for $5,621,800. By the Geneva award England paid to the U. S. government $15,000,000 for depredations committed upon our commerce by Confederate cruisers fitted out in its ports. On the 19th of June, 1866, the sloop-of-war "Sacramento," Capt. N. B. Collins, was wrecked on the reefs off the mouth of the Kathapalem, a branch of the Godavery River, in the Bay of Bengal. No lives were lost. In the autumn of 1866 intelligence was received that the American schooner "General Sherman" had been wrecked in the Ping-Yang River, Corea, and her officers, passengers, and crew murdered. The "Wachusett," Commander R. W. Shufeldt, on the 23d of January, 1867, was dispatched to investigate the circumstances, and to demand of the authorities the survivors, if any. No satisfactory answers were given to Commander Shufeldt. Information having been received of the wreck of the American bark "Rover" on the southeast end of the island of Formosa, and of the murder of all on board, Commander Febiger, in the "Ashuelot," proceeded to the locality to gather what information he could in reference to the affair, and to rescue the survivors, if any. He arrived in April, 1867, and required of the three different authorities an immediate investigation of the outrage. They claimed to be unable to bring to justice the perpetrators of the crime, who belonged to a horde of savages not obedient to their laws. Commander Febiger, with his limited force, deemed it unadvisable to resort to hostilities. Admiral Bell, in the "Hartford," with the "Wyoming," left Shanghai in the month of June for the purpose of destroying, if possible, the lurking-places of the savages who had murdered the crew of the "Rover." Arriving at the locality, a force of 181 officers, sailors, and marines, under Commander G. E. Belknap, accompanied by Lieut.-Commander A. S. Mackenzie, as second in command, —this officer having earnestly sought to go with the expedition,—they found the savages well armed and equal in courage to our North American Indians, who delivered their fire without being seen; owing to the high grass our men, in charging their coverts, fell into ambuscades. Upon one of these occasions the gifted, promising, and gallant Mackenzie was mortally wounded, and died before reaching the ship, lamented by all who knew him. Finding the inutility of further contending against a wily and brave horde of savages with men untrained to warfare of such a character, Belknap, about 2 P.M., wisely concluded to re-embark.

On the 1st January, 1868, Osaka and Hiogo, Japan, were quietly opened to foreigners. The harmony that prevailed on the opening of these ports was of short duration. Those opposed on the part of the Japanese broke out into open revolt. On the 27th January the contending parties came in conflict at Osaka. The tycoon, who was defeated, and who favored the extension of commercial intercourse, during the night of January 31, with some of his adherents, sought shelter on board the "Iroquois," and remained until morning, when the party went on board one of their war-vessels. On the 4th February, 1868, an assault was made by some Japanese troops at Hiogo on the foreign residents, during which one of the "Oneida's" crew was seriously wounded. All the foreign naval forces present united to protect the foreign settlement. On the 8th February a change of government occurred, when assurances were given to the U. S. legation that foreigners would be respected. The Japanese officer who ordered his troops to fire on the foreigners was executed in presence of a number of our naval officers, and of those of other nationalities. In April, 1868, Commander Febiger was again sent to the Corea to rescue, if possible, the crew and passengers of the "General Sherman," but on his arrival learned that none were alive. During the year 1868 the "Waterree" and "Fredonia" were destroyed by earthquakes on the western coast of South America. Twenty-seven officers and men were drowned on the "Fredonia." On the morning of the 29th October the "Saginaw," Commander M. Sicard, was wrecked on Ocean Island, in the Pacific Ocean. Officers and crew were saved through valuable assistance sent by the Hawaiian government, and a vessel sent by our commissioner, Mr. Pierce. Immediately after the disaster, Lieut. John G. Talbot and 5 others volunteered to

make the hazardous voyage to Honolulu, Sandwich Islands, a distance of 1500 miles, in a small boat to seek assistance. After a voyage of 31 days, during which they encountered terrible difficulties and dangers, and endured great suffering, they arrived on the 19th of December off Kanai, Sandwich Islands. They had previously lost their oars in a storm, and in attempting to land the boat capsized, and Lieut. Talbot and 3 others, already greatly debilitated, were drowned. William Halford, who alone survived, delivered Capt. Sicard's dispatches, upon the receipt of which the relief was at once dispatched. During the year 1871, Commander R. W. Shufeldt sent to the Department his report of and accompanying maps of the survey by the party under his command of the Tehuantepec route for a ship-canal. The survey for the Darien canal has been successfully completed by a party under Commander T. O. Selfridge, despite the great difficulties encountered in making way through the dense and almost impenetrable wilderness. He found the Atrato River, which he ascended 150 miles, navigable for vessels of the largest class the whole distance, with a width of 1500 feet and a depth of 30 feet. He reported that the actual length of the canal will be 31½ miles. Our government sent the "Worcester," "Supply," and "Relief" to Europe with supplies for the sufferers of the European war then raging. Our minister to China having been instructed to arrange a convention for the protection of sailors and others shipwrecked on the Corean coast, Rear-Admiral John Rodgers, with the "Colorado," "Alaska," "Monocacy," "Benicia," and "Palos," proceeded to Bois anchorage, Corea, for that purpose, accompanied by our minister to China. Upon the arrival of the fleet, and after communications and visits from the local authorities, a surveying party was sent out to pass up the channel past the Corean forts. After being allowed to pass, the boats on their return were treacherously fired upon. The small vessels accompanying the party hurried into action, drove the Coreans from their works, and succeeded in rescuing them, with 2 men wounded. An explanation was immediately demanded. At the end of 10 days none being offered, on the 9th and 10th June an attack was made upon the Coreans, 5 of their forts were captured and destroyed, 50 battle-flags and 481 pieces of artillery were taken. Our losses were 3 killed and 10 wounded, among the former being Lieut. Hugh W. McKee, a dashing and courageous officer. Finding it impossible to conclude a peaceful treaty, the expedition left. In the year 1872, Commander R. W. Meade, in the "Narragansett," concluded a verbal treaty of peace and amity with the native chiefs of the Navigator Islands.

On the 18th June, 1875, the "Saranac," while proceeding to Sitka, in passing through the Seymour Narrows, was caught in a whirlpool and thrown on a sunken rock, and so badly injured as to sink in deep water soon after. On this occasion valuable assistance was rendered by direction of the officer commanding the English naval forces. Preparations for observing the transit of Venus having commenced in December, 1874, the expedition sailed during 1875, and the results of the observations were forwarded to the Department. Two expeditions were sent out this year to complete the surveys for a canal route across the Darien Isthmus: one, under Lieut. Frederick Collins, to survey the Napipi route; the other, under Commander E. P. Lull, to make a survey near the line of the Panama Railroad. During the past eight years no less than seven surveys, with a view to ascertain the most practicable route for a ship-canal to connect the Atlantic and Pacific Oceans, have been made; three of these have already been noticed. In addition, a route has been surveyed between the Chepo River and the Bluff of San Blas; another in the vicinity of Caledonia Bay; also, a route by the way of the Tayra River and the valley of the Atrato. An instrumental survey was also made and a route located *via* Urana River, the mouth of the Atrato River, and by way of the Napipi River to the Pacific. These surveys have been performed with great zeal, skill, and self-devotion, several of the distinguished officers employed having been seriously injured in health by protracted exposure in a sickly and pestilential climate. Much has been accomplished in the direction of deep-sea soundings. Commander E. G. Belknap, in the "Tuscarora," upon two successive cruises, ran lines of soundings in the Pacific, between California, the Sandwich Islands, and Japan, with a view of laying telegraph-cables between those countries. The soundings were taken by means of an apparatus the genius of Belknap had devised, and the merits of which have been acknowledged and have received the highest commendation at home and abroad; 483 soundings were taken on the first cruise; on the second 107 were made. He was assisted by Commander J. N. Miller. Deep-sea soundings have also been made between St. Thomas, West Indies, and Cape Henry, by way of Bermuda, in the "Gettysburg." During the year 1879 the "Tuscarora," Commander J. W. Philip, was engaged in important surveys in the Pacific; Commander T. O. Selfridge in surveying the river Amazon, etc.; and Lieut.-Commanders F. M. Green and C. H. Davis were engaged in completing the work of telegraphically determining the longitudes of the east coast of South America. A complete chain of telegraphic measurements has been made with great exactness for the first time from Greenwich to Buenos Ayres, establishing precisely the geographical positions of Lisbon, Madeira, Porto Grande, Pernambuco, Bahia, Rio Janeiro, Montevideo, Buenos Ayres, and Para, and surveys and explorations in the interest of commerce have been made by several vessels of the navy cruising in different portions of the world.

For the facts and incidents connected with this summary of the achievements of the navy acknowledgment is made to Cooper's "Naval History," the "History of the Rebellion" embraced in Hamersly's first edition of the "Records of Living Officers of the Navy," and Farragut's life by his son, all of which have been accepted as authority. To the part the navy has taken in the various expeditions in the interest of science and commerce only allusion has been made, as they form subjects for separate articles in this work. So also in regard to the Naval Academy, the Torpedo School, Ordnance Instruction, Experiments, and kindred subjects. Of the present condition of the navy little can be said. Since the close of the war of the Rebellion

nothing has been done by the government in relation to the contest which has been going on between ordnance and armor. Our policy seems wise in waiting for the final determination of the question before building heavily-armored vessels. In regard to ordnance the conditions are changed; and it is a lamentable fact, we have not in service a gun of sufficient power to penetrate the plating of even a moderately armored vessel, and, saving some converted guns and howitzers, not a breech-loader. It is to be hoped that Congress will speedily make appropriations to supply guns of the most approved type and construction for our vessels of war, to place us upon an approximate equality with other maritime powers. Time was when our ships of war attracted admiration wherever they floated, and filled with just pride the American heart. Pre-eminent in their day were the famous "Old Ironsides" and the "United States"; then the line-of-battle ships "Ohio" and "Pennsylvania"; later the sloops-of-war "Portsmouth" and "Plymouth"; and more recently the "Colorado," "Wabash," and "Minnesota," magnificent steam-frigates, full of power and grace and beauty. In their day and generation these were the model ships of the world, and the United States in this regard the leading naval power. How hard to realize this when we are so poor in ships to-day as to be compelled to send an admiral to represent the power and majesty of a nation of 50,000,000 of people, and to command a foreign squadron composed of two small vessels, with one of these corvettes for his flag-ship, and with half her captain's cabin for his accommodation!—*Thomas H. Stevens, Rear-Admiral U.S.N.*

NAVY, VOLUNTEER.—On account of the emergency created by the great Rebellion of 1861, a large increase in the number of officers of the navy became absolutely necessary. The number of vessels in the navy, of all kinds, on March 4, 1861, was 76; the number purchased during that year was 136, and the number constructed 52, making the total number of vessels in the navy, in December, 1861, 264, or 188 more than March 4, 1861; and the number of enlisted men was increased during the same period from 7600 to 22,000. This great increase of vessels and men required more officers than the navy at that period, weakened by the withdrawal of many officers of all grades to engage in the Rebellion, could furnish; hence the Secretary of the Navy, early in 1861, determined to appoint acting officers, or, as they were called, to distinguish them from regulars, volunteer officers. There were several sources from which this required supply of officers could be obtained: 1st, the officers who had, during time of peace, resigned; 2d, acting midshipmen who had resigned, before graduation, from the naval school; 3d, those persons who had formerly served in the navy as petty officers and enlisted men; 4th, pilots and men employed in the Western rivers; and, 5th, and by far the most prolific, the commercial marine. Those appointed from the commercial marine, while being good seamen, were not proficient in gunnery, and, besides, they lacked the advantages of naval training; therefore, they were generally ordered first for ordnance instruction and the requisite and proper training. Notwithstanding the stringent regulations for discipline peculiar to the navy, the military bearing and address required, and the disadvantages before referred to, the good services and record of these officers are attested not only by the large number of promotions, after examination, but by many promotions for gallantry in battle and for faithful service, and by the fact that after the close of the Rebellion 4500 were honorably discharged with the thanks of the Department, and many were admitted, after examination, to the regular navy and to the marine corps.

During the year 1861 there were appointed 23 acting lieutenants, 29 acting volunteer lieutenants, 562 acting masters, about 300 master's mates, 88 acting assistant surgeons, 93 acting assistant paymasters, 240 engineers, and 340 officers of all grades in the Mississippi Squadron (those in the Mississippi Squadron were mostly appointed early in the year 1862), a total of about 1700. The acting lieutenants were officers who had formerly served in the navy; the acting *volunteer* lieutenants had not previously served in the navy, at least not as commissioned officers. Master's mates having been, in many cases, appointed by commanding officers of navy-yards, squadrons, and vessels, under general authority from the Secretary of the Navy, considerable trouble is experienced in arriving at the precise number in that grade, but 300 is doubtless a fair approximation.

Between March 4, 1861, and July 24 of that year, all acting appointments were made as a "military necessity," without direct authorization of law, but the act of July 24 provided that the "temporary appointments made, or which may be made, by the Secretary of the Navy of acting lieutenants, acting paymasters, acting assistant surgeons, acting masters and master's mates are ratified and confirmed as temporary acting appointments until the return of the vessels in which they are respectively employed, or until the suppression of the present insurrection, as may be deemed necessary." In July, 1862, the Secretary of the Navy began appointing acting ensigns, and the act of March 3, 1863, legalized the appointments.

As the rank of all the acting officers (except master's mates) corresponded with that of regular officers of like grade, their pay was made the same. By the act of May 17, 1864, the appointments of acting commanders and acting lieutenant-commanders were authorized, and by the act of March 3, 1865, the appointments of acting passed assistant surgeons; and the same act directed that master's mates (or acting master's mates) should be styled mates, and also provided that mates could be rated from seamen and ordinary seamen, such rating not to discharge them from their enlistment. The rating of enlisted men as mates had, however, been previously authorized by the Secretary of the Navy under the Department circular of October 7, 1863.

It is entirely impracticable to give anything like a fair and correct history of the individual services of these officers of the volunteer navy; indeed, such history would necessarily be incomplete, and there would, doubtless, be "invidious distinctions." Many acts of personal prowess were not specially reported, and, in the hurry and confusion incident to the times, the gallantry and meritorious services of not a few were uninten-

tionally overlooked, or not properly recognized and rewarded. In the second year of the war (July 16, 1862) it was enacted that any person who shall have received, or shall hereafter receive, a temporary appointment as acting volunteer lieutenant, or acting master, in the navy from civil life, may be confirmed in said appointment in the navy, and placed in line of promotion from the date of said confirmation, if, upon the recommendation of the President, he receives the thanks of Congress for highly meritorious conduct in conflict with the enemy. Although no promotions were specially made under this act, there were many made for gallant and meritorious conduct, and at the close of the war a board was organized (act of July 25, 1866) for the examination of candidates from the volunteer for admission to the regular naval service. Any line-officer who had served two or more years in the volunteer service was allowed to appear before the board. The number of candidates summoned to appear before the board was 426, the number appearing was 305, and the number found physically, mentally, and professionally qualified was 64. The names of those thus found qualified, and also the names of those officers who held the rank of acting lieutenant and acting volunteer lieutenant-commander, are hereinafter given, as well as the names of those, of all grades, who were transferred from the volunteer to regular service, or to the marine corps.

Found Qualified for Admission into the Regular Service.

Name.	Rank for which found Qualified.	Remarks.
N. Mayo Dyer	Lieutenant	In service, as lieutenant-commander.
Francis M. Green	"	In service, as lieutenant-commander.
Edward Hooker	"	In service, as lieutenant-commander.
Henry H. Gorringe	"	In service, as lieutenant-commander.
Alonzo W. Muldaur	"	Lost (as lieutenant-commander) in the "Oneida," January 24, 1870.
Joseph S. Cony	"	Did not accept appointment.
Charles O'Neil	"	In service, as lieutenant-commander.
Edward S. Keyser	Master	In service, as lieutenant-commander.
Thomas Nelson	"	In service, as lieutenant-commander.
De Witt C. Kells	"	Dismissed (as lieutenant-commander) February 4, 1879.
Felix McCurley	"	In service, as lieutenant-commander.
John McGowan	"	In service, as lieutenant-commander.
Gerhard C. Schulze	"	Died (as lieutenant-commander) September 28, 1875.
Edwin H. Miller	"	Died (as lieutenant-commander) November 7, 1874.
Henry C. Nields	"	In service, as lieutenant-commander.
Thomas F. Wade	"	Retired list (as lieutenant-commander), November 3, 1877.
James G. Green	"	In service, as lieutenant-commander.
George E. Wingate	"	In service, as lieutenant-commander.
George R. Durand	"	In service, as lieutenant-commander.

Found Qualified for Admission into the Regular Service.—Continued.

Name.	Rank for which found Qualified.	Remarks.
Charles A. Schetky	Master	In service, as lieutenant-commander.
John K. Winn	"	In service, as lieutenant-commander.
Thomas M. Gardner	"	In service, as lieutenant-commander.
Charles H. Rockwell	"	In service, as lieutenant-commander.
Charles M. Anthony	"	In service, as lieutenant-commander.
James M. Forsyth	"	In service, as lieutenant-commander.
George F. Wilkins	"	Retired list (as lieutenant), October 31, 1879.
H. Walton Grinnell	Ensign	Resigned (as ensign), 1868.
Nicholas B. Willetts	"	Died (as ensign), March 23, 1868.
Gilbert Morton	"	Retired list (as ensign), February 14, 1874.
William P. Randall	"	In service, as lieutenant.
George B. Livingston	"	" "
John J. Brice	"	" "
F. Aug. Miller	"	" "
William H. Mayer	"	Died (as lieutenant) June 1, 1879.
Henry G. Macy	"	Died (as lieutenant) December 1, 1872.
Oscar W. Farenholt	"	In service, as lieutenant.
William B. Newman	"	" "
Andrew J. Iverson	"	" "
William T. Buck	"	Died (as lieutenant) July 20, 1874.
Joseph Marthon	"	In service, as lieutenant.
Edward T. Strong	"	" "
William J. Dumont	"	Resigned (as ensign) September 11, 1868.
William H. Brice	"	Died (as lieutenant) July 6, 1874.
William H. Webb	"	In service, as lieutenant.
Charles S. Coy	"	Did not accept.
Ezra Leonard	"	Died (as lieutenant) July 29, 1870.
David G. McRitchie	"	In service, as lieutenant.
Zera L. Tanner	"	" "
Joseph E. Jones	"	" "
William Welch	"	" "
Samuel Belden	"	" "
James H. Stimpson	"	Declined appointment.
Henry R. Baker	"	Retired list (as lieutenant), December 2, 1876.
Eugene W. Watson	"	In service, as lieutenant.
John F. Merry	"	" "
William W. Rhoades	"	" "
John C. Morong	"	" "
William C. Gibson	"	" "
William B. Arrants	"	Retired list (as master), May 23, 1870.
Thomas G. Grove	"	In service, as lieutenant.
Walter Sargent	"	Lost (as master) in "Oneida," January 24, 1870.
James A. Chesley	"	In service, as lieutenant.
William A. Morgan	"	" "
William L. Howorth	"	Resigned (as ensign) April 4, 1869.

Officers holding Appointment as Acting Lieutenant.

Name.	When Appointed.	How and when left Volunteer Service.
Thomas F. Wade	May 8, 1861.	Appointment revoked October 2, 1861, and appointed an acting volunteer lieutenant.
James Parker	" 8, 1861.	Trans. to regular service.
E. Y. McCauley	" 11, 1861.	" "
John S. Barnes	" 13, 1861.	" "
J. S. Neville	" 13, 1861.	Appt. revoked Nov. 12, 1861.
J. N. Quackenbush	" 13, 1861.	Trans. to regular service.
J. P. K. Mygatt	" 13, 1861.	Resign. Dec. 12, 1861 (sick).
R. T. Renshaw	" 13, 1861.	Trans. to regular service.

Officers holding Appointment as Acting Lieutenant.—Continued.

Name.	When Appointed.	How and when left Volunteer Service.
Edgar Brodhead...	May 13, 1861.	Promoted to acting volunteer lieut.-commander.
J. P. Sanford.........	" 13, 1861.	Trans. to regular service.
Thomas A. Budd...	" 13, 1861.	Killed in action, March 22, 1862.
Charles Weston.....	" 13, 1861.	Resigned August 16, 1861.
P. G. Watmough...	" 13, 1861.	Trans. to regular service.
J. Van Ness Philip	" 14, 1861.	Died September 3, 1862.
Robert A. Knapp...	July 27, 1861.	Resigned Nov. 18, 1861.
S. E. Woodworth...	Sept. 10, 1861.	Trans. to regular service.
R. Townsend.........	" 17, 1861.	" "
Edm. R. Colhoun...	" 24, 1861.	" "
R. W. Shufeldt......	" 25, 1861.	" "
S. J. Shipley.........	" 25, 1861.	Appointment revoked February 6, 1863 (sick).
De G. Livingston...	" 30, 1861.	Declined appointment.
Simon C. Mish.......	Nov. 23, 1861.	Dismissed Dec. 24, 1861.
C. H. Baldwin.......	Dec. 27, 1861.	Trans. to regular service.
Joseph C. Walsh...	Feb. 11, 1862.	Resigned May 1, 1862.
F. S. Conover........	Sept. 13, 1862.	" Aug. 11, 1863.
J. MacLeod Murphy	Dec. 4, 1862.	" July 30, 1864.
J. D. Danels	June 3, 1863.	Promoted to acting volunteer lieut.-commander.
E. C. Merriman.....	Sept. 25, 1863.	Trans. to regular service.

Officers holding Appointment as Acting Volunteer Lieutenant-Commander.

Name.	When Appointed.	How and when left the Service.
Joseph D. Danels...	May 18, 1864.	Trans. to regular service.
Edgar Brodhead...	Oct. 22, 1864.	Resigned March 2, 1865.
W. C. Rogers	" 24, 1864.	Hon. disch. July 18, 1866.
William Budd.......	Nov. 5, 1864.	" Jan. 6, 1866.
Thomas P. Ives.....	" 7, 1864.	Died November 17, 1865.
William R. Hoel...	" 10, 1864.	Hon. disch. Dec. 30, 1865.
Joseph B. Breck...	" 25, 1864.	Died July 26, 1865.
Theo. B. DuBois ...	" 26, 1864.	Hon. disch. Feb. 7, 1866.
William H. West...	" 30, 1864.	" Oct. 24, 1865.
Edward Conroy.....	Dec. 8, 1864.	" Oct. 30, 1868.
Pierre Giraud.......	" 9, 1864.	" Jan. 15, 1869.
Wm. B. Eaton......	" 12, 1864.	" Jan. 13, 1866.
C. F. W. Behm......	" 22, 1864.	" Nov. 28, 1865.
J. W. Smith	Feb. 7, 1865.	" Feb. 21, 1866.
Edward Hooker....	" 7, 1865.	Trans. to regular service.
Edward F. Devens	" 7, 1865.	Hon. disch. Nov. 19, 1866.
J. MacDiarmid......	March 3, 1865	" Oct. 28, 1866.
L. W. Pennington.	" 3, 1865.	" Nov. 12, 1865.
W. S Cheeseman...	" 9, 1865.	" Sept. 30, 1865.
Wm. P. Randall....	" 9, 1865.	" Dec. 19, 1865.
C. H. Rockwell......	" 27, 1865.	" Dec 8, 1865.
T. A. Harris.........	April 26, 1865.	" Oct. 24, 1865.
R. B. Smith..........	" 29, 1865.	" Jan. 1, 1866.
Frederick Crocker	May 1, 1865.	" Oct. 2, 1865.
J. F. Nickels.........	" 6, 1865.	" Oct. 26, 1865.
James Trathen......	" 16, 1865.	" May 26, 1866.
John A. Johnston..	" 19, 1865.	" Dec. 9, 1865.
Wm. G Saltonstall	" 20, 1865.	" Oct. 5, 1865.
Frederick S. Wells	" 27, 1865.	" March 31, 1866.
Chas. A. French....	" 30, 1865.	" Oct 21, 1865.
Samuel Huse........	" 31, 1865.	" March 31, 1866.
H. H. Gorringe......	July 10, 1865.	Trans. to regular service.
Wm. Hamilton	" 17, 1865.	Hon. disch. April 15, 1866.
William Flye........	" 21, 1865.	" Dec. 24, 1865.
C. J. Van Alstine...	Aug. 14, 1865.	" April 30, 1866.

Other Volunteer Officers who entered the Regular Service.—From Acting Passed Assistant Surgeon to Passed Assistant Surgeon: Daniel C. Burleigh and Francis V. Greene.

From Acting Assistant Surgeon to Assistant Surgeon: John H. Austin, Joseph G. Ayres, George A. Bright, Henry W. Birkey, J. Wesley Boyden, Edward B. Bingham, Horatio N. Beaumont, Hosea J. Babin, Thomas R. Brown, John W. Coles, Elwood M. Corson, Joseph T. Cottrell, George S. Culbreth, Fredk. M. Dearborne, Henry A. Dauker, Isaiah Dewling, J. Milton Flint, George S. Fife, Leslie D. Frost, Edward Frothingham, Charles L. Green, James N. Hyde, William H. Jones, William T. Kemp, Fredk. Krecker, Jerome H. Kidder, Grenville B. Le Compte, William V. Marmion, Ernest D. Martin, Joseph W. Newcomer, Charles H. Page, Henry L. Plympton, Henry T. Percy, Jeremiah J. Page, William M. Reber, John S. Ramsay, William J. Simon, John D. Smith, J. Rufus Tryon, Adam Trau, Edmund C. Ver Meulen, George F. Winslow, William H. Wescott, Robert Willard, David V. Whitney, James Wilson, F. W. Wunderlich, Edward H. Ware, Robert A. Whedon, Holmes Wikoff.

From Acting Assistant Paymaster to Passed Assistant Paymaster: R. W. Allen, H. M. Meade, Frank Clark, A. D. Bache, D. B. Batione, W. F. A. Torbert, E. H. Cushing, L. A. Frailey, John H. Stevenson, T. L. Tullock, J. W. Fairfield, E. M. Hart, G. E. Hendee, M. B. Cushing, J. H. Bulkley, R. B. Rodney, J. S. Giraud, S. S. Wood, F. J. Painter, G. L. Mead, W. W. Woodhull, G. R. Watkins, D. P. Wight, H. T. Wright, D. A. Smith, C. A. McDaniel, F. H. Arms, John Furey, J. Linsly, F. T. Gillett, G. H. Griffing, E. Mellach, George W. Brown, Edward Sherwin, G. A. Robertson, J. H. Mulford.

From Acting Assistant Paymaster to Assistant Paymaster: Charles H. Eldredge, Richd. Washington, Rufus Parks, William W. Williams, Forbes Parker, George W. Beaman, Joseph T. Lisle, F. R. Curtis, W. H. Sells, C. S. Perley, W. S. Blunt, Charles Fairchild, C. E. Chenery, H. A. Strong, Jesse P. Woodbury, W. L. Darling, G. R. Martin, W. H. Anderson, W. C. Cook, G. S. Benedict, Theoron Merritt, G. R. Rand, W. N. Watmough, Worthington Goldsborough, G. DeF. Barton, W. R. Winslow, H. P. Tuttle, F. H. Hinman, R. P. Lisle, C. F. Guild, J. E. Tolfree, L. G. Billings, J. F. Hamilton, C. P. Thompson, F. H. Swan, J. J. Philbrick, S. T. Browne, A. W. Bacon, F. C. Imlay, R. S. McConnell, C. D. Mansfield, H. T. Skelding, C. W. Slamm, J. A. Berry, Joseph Foster, E. N. Whitehouse, John MacMahon, Theo. S. Thompson, William J Thomson, H. G. Colby, J. R. Carmody, J. B. Redfield, William J. Healey, Henry Gerrard, John F. Tarbell, I G. Hobbs, J. P. Loomis, H. T. B. Harris, H. C. Machette, C. H. Lockwood, A. T. Hubbard, C. E Boggs, Frank Bissell, H. T. Stancliff, A. H. Nelson, G. F. Bemis, F. C. Alley, G. H. Read, J. Q. Barton, A. J. Greeley, S. D. Hurlbut, H. A. Thompson, Jr., C A. Cable.

Officers of the Marine Corps who served as Volunteer Officers in the Navy: D. Pratt Mannix, Lewis R. Hamersly, Henry C. Cochrane, William S. Muse, Albert H. O'Brien.

From Acting Third Assistant Engineer to Assistant Paymaster: Stephen Rand.

From Acting Chief Engineer to Chief Engineer: J. Q. A. Ziegler.

From Acting Third Assistant Engineer to Second Assistant Engineer: Jabez Burchard, W. B. Bayley, J. P. Mickley, E. F. McElmell, W. H. Platt, H. E. Rhoades.

From Acting Second Assistant Engineer to Second Assistant Engineer: T. J. W. Cooper, Geo. Cowie, J. T. Smith.

From Acting Third Assistant Engineer to Third Assistant Engineer: George W. Baird, O. B. Mills, W. G. McEwen, H. L. Slosson, Harrie Webster, E. G. Allen.

As Boatswain: William Allen, W. S. Bond, Jeremiah Harding, Josiah B. Aiken, John H. Brown, T. S. Collier, W. G. Tompkins, F. A. Dran, John Smith, James Heron, James Nash, Joseph McDonald, Hallowell Dickinson, J. S. Sinclair, J. W. Simmons, Thomas Savage, C. E. Hawkins, Daniel Ward, Michael Hickey, W. Burditt, W. P. Burke, Edward Cavendy, Edwin Consey, Woodward Carter.

As Gunner: Felix Cassidy, James Hayes, D. W. Burroughs, Cornelius Cronin, W. T. Devlan, George Dunn, W. A. Ferrier, John Russell, C. B. Magruder, A. A. Phelps, C. H. Venable, C. A. Young, C. C. Neil, M. K. Henderson.

As Carpenter: Oliver W. Griffiths, E. D. Hall.

As Sailmaker: Thomas S. Gay.

Appointed from the Volunteer Navy to the Regular Navy on the Retired List: Henry C. Keene (as lieutenant), E. E. Bradbury (as master), L. R. Chester (as master), H. F. Moffatt (as master), Wesley W. Bassett (as master).

Appointed a Lieutenant in the Navy from Master's Mate: William B. Cushing.

The names of these volunteer officers of the higher ranks are given not because they were in all instances more conspicuous for gallantry and more faithful in their services than others of lower rank, but because the space allotted to this article renders it impossible to give the long roll of those worthy of mention. Nor should it be presumed that those admitted into the regular service were the only ones qualified therefor. A large majority entered the volunteer navy for the single and heroic purpose of giving their services, and, if need be, their lives, for the preservation of the Union. That object attained and the authority of the government re-established on land and sea, resignations in large numbers immediately followed, the volunteer deeming his work and duty done and the object for which he entered accomplished.

On May 1, 1865, the Rebellion being then practically ended, the work of reducing the volunteer navy was commenced. The Secretary of the Navy ordered that, in mustering out volunteer officers, all in the service on that date should be allowed one month's leave of absence for each year of service. On the 1st of January, 1865, there were 5278 volunteer officers of all grades in the navy, while on the 1st of January, 1869, there were but 170, and on the 1st of January of the year following only 111.

It was not, however, until July 15, 1870, that all acts or parts of acts authorizing the appointment of temporary acting officers of the navy, except as to assistant surgeons, were repealed. The authority of the Secretary of the Navy to retain any volunteer officers after the close of the Rebellion was given by the act of July 25, 1866, and the exercise of that authority was by the act made conditional upon its being required by the exigencies of the service.

The act of February 15, 1879, provided for the honorable discharge or transfer to the regular service, as might be determined, of acting passed assistant surgeons and acting assistant surgeons, and abolished the volunteer navy of the United States.—*J. E. Dow.*

NAVY OF THE SOUTHERN CONFEDERACY.—The history of the navy of the Southern Confederacy has yet to be written. This article does not aim at giving that history even in its most epitomized form. Our object is simply to notice briefly and cursorily the general character of that service, some of the embarrassments attending its creation, and a few of its more prominent operations, more especially those which may serve to illustrate the action and value of the new class of vessels which the South for the first time ushered into naval warfare.

The Southern navy was modeled precisely after that of the United States. The same articles of war and internal rules were adopted, and the same discipline, usages, and general routine prevailed. With all these accessories, the older officers, holding their accustomed rank and surrounded very much by their former familiar associates, might have had need at times to cast a glance at the flag overhead or at the gray they had donned in place of the blue to realize fully that they belonged to a new service, foreign and hostile to the one in which they had passed the better part of their lives.

This organization was working smoothly and efficiently when a sweeping change was made by an act of Congress passed in May, 1863, creating a new service styled the "provisional navy." The officers appointed to it were all taken from the older service, now contradistinguished as the "regular navy." The juniors were transferred *in toto;* the seniors were selected by the Secretary of the Navy: all maintained unimpaired their status in the old navy.

The vessels, with all their *matériel* and their entire crews, were next summarily transferred *en masse* to the new creation, and the regular navy, thus stripped of all its properties, was reduced to a small body of veterans still in the vigor of life, yet cut off from all participation in service afloat, and consigned to the comparative inaction of "shore duties," which, nevertheless, were shared in common with the provisionals.

This duplicate organization of a general service, which, despite its nominal partition, remained essentially one and the same, was attended with confusion, embarrassments, and even more serious objections, that after a year's trial led the chief of the bureau of detail to recommend that the transfer to the new service should be made to embrace all the officers indiscriminately; but high officials are seldom inclined to brook any interference with pet measures, and the suggestion found no favor.

About the same time another act was passed to establish what was called the "volunteer navy." The effect of this measure would have been to systematize privateering, and, by combining its forces under the guise of a new name into a national marine, to raise it to a higher level than could be attained by single and independent vessels sailing under the authority of letters of marque and reprisal. There is reason to believe that Congress was in some degree prompted to this course by the agreement which had been concluded between the maritime powers of Europe, in 1855, to place privateering *hors de loi*, for, though this agreement was only binding upon the parties assenting to it, its moral effect as a public expression of European sentiment tended to put that method of aggression under

ban and at discredit wherever practiced. The more immediate object, however, was to induce capitalists to invest in enterprises that promised swift and profitable returns, with the advantage to the government of despoiling the commerce of the enemy without cost to the treasury.

The law authorized the President to accept the services of armed vessels, furnished and equipped at the expense of the owners, to appoint officers, confer assimilated rank, define the rights and duties of those engaged in the ventures, and establish rules for the general government of the whole. But the statute was adapted rather to the genius of a commercial than an agricultural people, and met no hearty response. It is believed that no vessel was ever equipped for the service proposed.

There was yet another marine force, which is only noticed to dissociate it from the navy with which the historians of the day confound it. It was styled the "river defense," or more popularly "Montgomery's fleet," and consisted of a number of Mississippi steamboats, commanded and manned exclusively by river-men, and placed under the control of the War Department. These boats, with their engines protected by a barricade of cotton and their bows revetted with a plating of iron, were designed for the special purpose of running down and sinking the ironclads of the enemy. Part of the fleet was eventually destroyed by their own commanders after co-operating with the navy in the unsuccessful attempt to prevent the Federal fleet from passing Forts Jackson and St. Philip, in April, 1862, and the rest for the most part were captured or sunk during a hotly contested engagement with a superior force of ironclads off Memphis, in June of the same year.

It is no disparagement to the Confederate navy to say that it played comparatively a subordinate *rôle* in the war. The reason for this is obvious. At the outbreak of hostilities the South had no navy, in the proper sense of the term, nor did she possess at any time during the struggle a sufficient number of efficient vessels to cope with the powerful squadrons mustered along the entire coast. She had a body of valuable recruits of every grade in the naval officers who had resigned from the U. S. service, and a limited number of seamen and stokers who had been thrown out of employment by the stoppage of trade, but was destitute of ships, and before she had time to construct them found herself in the thick of the conflict. In this strait the government was driven to the usual expedient in such cases,—a wretched makeshift at best,—that of attempting to turn merchant craft into warships. But no ingenuity of the shipwright could achieve the transformation with such material as the dock-yards of the South afforded. Vessels like British mail-steamers, adapted in their original structure to war contingencies, or the stoutly timbered clipper-ships of New York might be proper objects for such conversion; but the South, with the exception of a few sea-going vessels picked up here and there, had to rely mainly on steamboats and steam-tugs, river barges, canal- and ferry-boats. The inadequacy of trumpery fleets made up of such material soon became evident.

When Dupont appeared with his large and well-appointed squadron off Port Royal in November, 1861, he found nothing to oppose him on the water but 7 small merchant craft improvised into war-ships, and commonly known under the derisive name of "mosquito fleet." They were under the command of Commodore Tatnall, who could do no more than hover on the outskirts of the enemy, and attempt ineffectually to interrupt the sounding-parties as they were feeling their way over the bar. Later, during the following February, Commodore Lynch found himself in a similar position. He was stationed on the sounds of North Carolina with orders "to hold those waters to the last extremity." To make good those brave words his pennant was floating over the same number of vessels of insignificant size that but a few weeks since had been river traders or canal-boats. When the Federals made their combined attack on Roanoke Island, on the 7th, he was confronted by 33 vessels of various descriptions, comprising 17 steam-gunboats armed with guns of the heaviest calibre, among which were 80- and 100-pounders. In the first action, conducted at long range, he lost two of his vessels,—one sunk and the other disabled. Two days afterwards the battle was renewed off Elizabeth City, and the small flotilla was well-nigh annihilated, one boat only escaping, which made its way through Dismal Swamp, the rest being captured by the enemy or blown up by their own commanders. On the Mississippi similar disasters overtook the same wretched class of vessels about the same time. Here, in February, 1862, Commodore Hollins was co-operating with the land forces with a force of 5 converted gunboats carrying in all 32 guns,—7½-inch rifles and 8-inch smooth-bores. These "shells," as they were facetiously called, answered pretty well for intercepting military transports or occasional brushes with the hostile batteries; but as yet they were separated by the formidable batteries on Island No. 10, at the bend of the river near New Madrid, from Foote's ironclads and mortar flotilla, the first alone mounting 75 guns in the aggregate, including 10-inch columbiads, 9-inch smooth-bores, and 100-pounder rifles.

They were not, however, fated to encounter that powerful fleet. Upon the fall of Island No. 10 they were dismantled of their guns, which went to strengthen the batteries of Fort Pillow, and in this defenseless state were finally burnt to escape capture on the approach of the Federal squadron from below.

Early measures were taken for forming a navy. A secret agent employed at New York was directed in March, 1861, to purchase vessels suitable for conversion into men-of-war. Soon afterwards an officer of the line, accompanied by a competent engineer, was sent for the same purpose to New York, Philadelphia, and Baltimore, and yet another envoy was dispatched to buy a certain steamer in Canada. All these efforts proved fruitless; the Canadian steamer, for some reason, could not be obtained, and the United States had forestalled the South by purchasing or chartering whatever was available in its own waters. Naval officers were also hurried to England and France, provided with ample funds to purchase ironclads, or, in default of this, to have them built, and to procure arms, ordnance stores, and supplies of all kinds. The hope of acquiring ironclads in this way must

have been prompted by the prevailing delusion of the moment that the great staple of the South would control the policy of those nations by forcing them into open hostilities in her behalf, or at least by inducing them to connive at the equipment of armaments in their ports. These hopes, as we all know, were not realized. The officers, being thus baffled in their first purpose, were instructed to have wooden vessels built in England for cruising on the high seas.

To accomplish this required secrecy, tact, and finesse of no common order. The English law known as the "Enlistment Act," passed under one of the Georges, prohibits, "under a penalty of fine and imprisonment, with forfeiture of property," the equipment of any vessel to be employed against the subjects or citizens of a state at the time in amity with England. To evade this act in the face of police authorities kept keenly on the alert by spies and detectives employed by the United States seemed almost a hopeless attempt; yet, in spite of every obstacle, the "Alabama," the "Georgia," the "Florida," and the "Shenandoah," which severally inflicted so much damage on the commerce of the United States, forcing almost the entire trade into foreign bottoms, were all built in British waters, from which, as soon as completed, they sailed openly under the English flag, bound to the appointed rendezvous of some lonely island, where they received their armament, hoisted the Confederate flag, and launched forth on their adventurous career.

The views of the Secretary of the Navy in regard to the character and extent of the naval preparations that were required to put the South on a good naval footing may be gathered from a communication addressed by him to the Executive under the date of March 2, 1862, for the information of Congress. In this document he states that there was or might be necessary during the current year "50 light-draft and powerful steam-propellers plated with 5-inch bar-iron and equipped for service in our own waters, 4 iron- or steelclad 10-gun frigates of about 2000 tons each, and 10 clipper-propellers with superior marine engines, both classes of vessels designed for deep-sea cruising." He desires provision made for "3000 tons of boiler- and plate-iron, 1000 tons of rod-, bolt-, and bar-iron, 3000 pieces of heavy ordnance ranging in calibre from 6 to 11 inches and in weight from 6000 to 14,000 pounds, 1000 tons of musket-powder for filling projectiles and pyrotechny, 4000 naval revolvers, and 4000 cutlasses with equipments and ammunition." To utilize this vast amount of material he requires "3000 seamen, 4000 ordinary seamen and landsmen, and 2000 mechanics."

Looking at the poverty of our internal resources and almost entire dependence for means and appliances for naval purposes on foreign supplies at the time this communication was penned, the project it unfolds would rather seem the Secretary's ideal of what the foundation of the Southern navy should be than a well-studied plan proper for legislative consideration. But that official was looked to by Congress for the initiation of its naval measures, and it was perhaps his wisest policy to present affairs under such an aspect as would inspire confidence and promote liberal appropriations. The suggestion of ironclads for sea-cruisers at the time seemed premature. The question of rendering that class of vessels capable of encountering the perils of the sea had not yet been solved by satisfactory tests. As the most advanced ship in that line of improvement, the representative vessel was the French frigate "La Gloire." She was the final product of the best French engineering science and skill which had been prosecuting its investigations through a succession of costly experimental structures, and it was claimed that she was as invulnerable to the storms of the ocean as to the shot of the enemy. The English, however,—better authorities on nautical subjects than their neighbors across the Channel,—denied the sea-going qualities of their crack ship.

But, accepting the Secretary's views as real and earnest, let us examine as briefly as may be some of the difficulties he had to encounter in the attempt to carry them out, and what finally was the outcome of his labors, which continued up to the last year of the war.

It will be readily seen that it was no easy task to create a navy in a country at once invested by sea and invaded by land, depending largely on foreign supplies for many of the most important materials, yet snatching them as it were from the chances of blockade-runners, and constantly compelled by the advance of the enemy to abandon or destroy vessels still on the stocks or retreat with others more advanced to safer points for completion. Thus the progress of the work was frequently checked and delayed, and much that had been accomplished at great cost rendered abortive. Gunboats in process of building were lost in this way by the capture of Nashville; 2 were destroyed on the ways when Norfolk was evacuated; some 10 or 15 in various stages of construction on the shores of the York and Pamunkey Rivers were sacrificed as the Confederates retired from the Peninsula; when Memphis was threatened one ironclad unfinished was hurried off to the upper waters of the Yazoo, and the torch applied to her consort still unlaunched; and the greatest loss of all was that of the "Mississippi," a powerful ironclad, destroyed when nearly completed, off New Orleans, to prevent her capture by the Federal fleet near at hand.

These were only some of the disasters arising from the cause stated. Had all of them been reckoned at the time, the sum-total might have created a fear that the work of demolition was fast overtaking that of construction.

Besides such reverses, the inadequacy of our resources beset the task of construction at the outset with endless hinderances. The South had two dock-yards only. That at Pensacola was too remote and isolated for the occasion. The Norfolk yard was a priceless acquisition, with its dry-dock, foundry, machine-shops, its stores of material and supplies and large amount of ordnance, but the facilities it afforded could only be utilized on the spot, while the necessities of the case required that the vessels should be built in every quarter.

The Tredegar Iron-Works, at Richmond, were the only ones in the whole Confederacy capable of casting guns of heavy calibre, until the government erected its own establishments at Charlotte and Selma.

In the entire Confederacy there was not a re-

liable establishment, except in Tennessee, where a first-class marine engine could be constructed. Three rolling-mills only existed in the whole country, two of which, in Tennessee, were unavailable owing to the disturbed condition of the districts in which they were located, and the third, at Atlanta, Ga., had to undergo extensive alterations, involving serious delay, before it could undertake the heavy work of the navy. The private machine-shops and foundries resorted to by the government in the absence of public establishments of the kind were everywhere more or less crippled by the loss of operatives, who had enlisted in the land service. The navy was especially pushed for skilled workmen to build its ships, and seamen to man them when built. Both of these classes had been largely absorbed by the army, which was unwilling to relinquish them. Laws passed for the recovery of them for naval uses became well-nigh inoperative from the complicate and dilatory processes of red tape and routine that hampered every effort to attain the object. Not more than one-tenth of those for whom application was made could be obtained, and these were mostly detailed for limited periods instead of being permanently transferred.

At the outset the navy was in pressing need of everything,—hemp, coal, iron, powder, ordnance, ordnance stores, medical supplies, provisions, clothing; in short, almost every article of prime necessity. Even the wood of which the vessels were built was generally standing green and flourishing in the forest when the contract which was to utilize it was signed.

To supply most of these wants the main reliance of the South, as already stated, was upon blockade-runners. All the Southern ports were busily engaged in these enterprises, much of their capital and energy, shut out from the usual fields of activity, being now concentrated in this one eager pursuit. Wilmington, N. C., took the lead, trading chiefly with Europe, but Charleston, Mobile, Savannah, and New Orleans had their full share in the new game of chance. Nor were other places less noted idle. Along the extensive Southern estuaries might be found here and there at some obscure inlet or sheltered cove an improvised settlement diligently prosecuting the same traffic, the vessel screened by a convenient headland tufted with trees, and the neighboring beach strewn with cotton in process of shipment, or perhaps piled with a freight just landed and worth now a hundredfold its cost, and all these busy doings going on with the watchers outside not a whit the wiser.

The Navy Department was soon itself compelled to become an active and direct participant in these ventures. When, from the exhaustion of its funds abroad and the depreciation of its currency, it was found impracticable to purchase exchange in the ordinary way, shipments of cotton were made to Europe on naval account to provide means for obtaining home freights. The appropriations applied in this way incurred the double risk of the homeward and outward voyages, and the ventures were not always fortunate.

In addition to all these drawbacks to the work of construction, one of no little magnitude had to be encountered in the transportation of heavy naval material, such as ordnance, propeller shafts, and machinery, from the point of manufacture to the building depots, over dilapidated railways already overburdened by the conveyance of troops with provisions and munitions of war and by the general—or it might be called the universal—travel, for the whole population seemed to be in motion.

As time advanced some of these evils were remedied, some wants keenly felt at first abundantly supplied, and new means and appliances brought into active play. Naval ordnance works and laboratories were established at Richmond, Charlotte, Atlanta, and Selma, which facilitated the work and largely increased the war products. A special bureau was appointed to foster the coal and nitre interests, with satisfactory results. Powder-works at Columbus, Ga., were made to yield all the powder the navy required. Rolling-mills at Richmond turned out iron plating whenever the raw material could be obtained, and at rope-walks set up at the same place the cotton fibre was successfully substituted for hemp, making a substantial cordage. But no human agency could find a substitute for iron, the great, the pressing want of the Confederacy during the whole struggle. Scarce at the beginning, towards the close it was not to be had at any price. In the early part of 1861 it was quoted at $25 per ton, in 1862 it had risen to $200, and in January, 1865, the price was $1300. The home product, never adequate to meet the ordinary local wants, much less the necessities of the government, had by this time been narrowed down to its minimum through the occupation of the mining areas by the enemy, and the supply from abroad had dwindled to driblets.

The work of constructing a navy, once commenced, was prosecuted with as much vigor as limited resources and trammeled facilities allowed. It began to take shape and system in July, 1861, though before that time the keels of some 15 gunboats had been laid at the York River and Pamunkey, and a few others at scattered points.

Our active naval force at that period could be easily reckoned. The "Sumter," of 530 tons and 10 guns, had run the blockade and was cruising in open sea. The "McRea," of 180 tons and 7 guns, with the "Jackson," converted from a river tug-boat, were in commission on the lower Mississippi. Two small steamers had been purchased from North Carolina for the defense of her sounds. Three side-wheel steamers, the "Patrick Henry," "Jamestown," and "Yorktown," had been brought from Virginia. The first of these was our most powerful vessel. She was of 1300 tons burden, armed with six 8-inch broadside guns and two 10-inch pieces on pivot, and had the most vulnerable parts of her engine shielded with iron. These vessels, with the "Lady Davis," the "Simpson," the "Resolute," and perhaps a few other light vessels not worthy to figure in naval annals, constituted the active naval force of the South at the period stated. The "Merrimac," afterwards the "Virginia," was on the stocks undergoing her conversion into an ironclad. The sloops "Germantown" and "Plymouth," sunk before the Gosport yard came into the possession of the South, had been raised and restored, but were never put in commission.

The *personnel* of the navy consisted of 9 captains, 26 commanders, 64 lieutenants, 4 masters,

75 midshipmen (full and acting), 19 surgeons and 10 assistants, 7 paymasters, 3 chief engineers and 10 assistants of all classes, 4 boatswains, 3 gunners, 4 carpenters, 3 sailmakers, and 500 enlisted men. All the officers of the superior grades and the greater part of those of the lower had resigned from the Federal navy.

In the summer and autumn of 1861 contracts were made for 11 steam-gunboats in all at the several points of New Orleans, Jacksonville, Richmond, Norfolk, Charleston, Chattahoochee River, and Pensacola Bay. In August two armored vessels were commenced under contract at Memphis, and in October the keels of two additional ones were laid at New Orleans.

Reserving for a somewhat more extended notice the "Virginia," which came first in the order of construction, let us here trace in a few words the history of these ironclads up to their final fate. One of the two last mentioned, the "Louisiana," Capt. Mitchell, not yet properly sheathed, altogether in an unfinished state, and totally unprepared for action, was forced by the emergency to take part in the defense of the approaches to New Orleans when that city was captured. At the earnest solicitation of Gen. Duncan, commanding Forts Jackson and St. Philip, she was hurried down to the approaching scene of conflict between the forts, where she arrived only three days before the hostile squadron made its memorable advance up the river on the 24th of April, 1862. She had left the levee, under tow of another vessel, with gangs of mechanics still working at her engine and her raw crew short in complement and eked out by an artillery company, who volunteered for the occasion, busy in mounting a battery at which they had never been exercised. Up to the hour of the fight she had not sufficient motive-power to stem the current of the river, and even to shift her berth from point to point required extraneous assistance. During the desperate contest that took place she was secured to the shore under Fort St. Philip in a position that precluded the use of half her guns. She was so powerful a vessel that had she been thoroughly completed and prepared for battle some interesting incidents would have been added to that night's encounter.

The "Louisiana" was 264 feet long, with a beam of 64 feet. Her hull, which was nearly submerged, was surmounted by a casemate protected by a covering of double T-rails as a substitute for iron plates that could not be obtained, and inclined at both sides and ends at an angle of 45°. A metallic deck formed the top of the casemate, and was the station of the small-arm men when at quarters. It was open overhead, but guarded against grape and canister by heavy bulwarks plated with iron. The battery consisted of 16 guns, made up of two 7-inch rifles, three 9-inch shell pieces, four 8-inch and seven 6-inch smoothbores. The propelling power was two central wheels inclosed in the body of the hull and a propeller on each quarter, which last assisted in steering. The armor passed through a severe test during the action, receiving a broadside at close quarters from the 8-inch rifled guns of the "Hartford." The shells buried themselves to about half their diameter, then fell crumbling into the river.

The surrender of the forts to the mortar flotilla three days after the action with the fleet completely isolated the ironclad. Hemmed in above and below by overpowering forces, without means of replenishing her supplies, and scarcely capable of stemming the current, notwithstanding the completion of her engines since the engagement, her capture even by simple blockade was a mere question of a few days. In this extremity a council of war was held, which decided upon her destruction. She was accordingly set on fire, and her officers and crew, who had taken refuge on board of tenders, where they were soon made prisoners, witnessed from the decks of the enemy the final catastrophe, when her magazine exploded and her fragments were given to the waters.

The new ironclad built at New Orleans was pronounced "wonderful" by a veteran commodore who had served in almost as many ships as he had years. And she was wonderful for her novel structure, her massive weight and strength, and her abundant promise of speed and power. The work upon her had been watched and urged with unusual solicitude by the Department from the moment the first plank was laid, and the most glowing hopes were entertained of successes that were to follow her completion. It was believed —and the belief was not thought extravagant at the time—that when armed and equipped she would almost unaided be capable of assuring naval supremacy in the Mississippi waters, and even of raising the blockade of the Gulf ports.

The structure of this vessel was peculiar and entirely new. Some years ago a Scotchman who had never been to sea wrote an original treatise on naval tactics which became the text-book of the royal navy, and in the instance of the "Mississippi," a planter in the interior of Georgia, Mr. Nelso Tift, who knew nothing of naval architecture, incited by the exigencies of the moment, conceived a new method for building naval ships, which his brother, Mr. Asa F. Tift, a merchant of Key West, assisted him in developing. His device was designed to obviate the difficulties arising from the great scarcity of shipbuilders, and the equal scarcity of the crooked timber which they employed. The hull of an ordinary vessel is made of a skeleton of futtocks, curved ribs, and crooked cross-knees, to which the planking, artificially bent to follow the lines of the model, is bolted outside and inside. The plan of the Tifts dispensed altogether with this complicate frame-work, and substituted for the sides of the vessel a solid wall of pine planks built with the requisite thickness upon a flat bottom, and having only straight lines and flat surfaces except at the junction of the sides with the ends. This plan made available for every purpose of the structure, from stem to stern, the tall straight timber of the Southern forests, and the simplicity of it placed the work within the capacity of ordinary house carpenters and joiners.

The Tift brothers submitted their plan to the Secretary of the Navy, and that official, upon its being approved by a board of experts, appointed the inventors agents of the Navy Department to carry the plan into execution by the construction of the "Mississippi" at New Orleans. That city, as the great commercial metropolis of the South, and at the gateway, as it were, of the Mississippi, was one of the most important strategic points indicated in the movements of the enemy, and as yet it was almost naked of naval defenses.

It were tedious to recount all the obstacles these men, who voluntarily served without compensation, had to conquer to achieve the work they had undertaken. A building depot had in the first instance to be created, which involved the sinking of piles in the alluvial banks of the river for the bed of the ship, and the erection of sheds, saw-mills, blacksmith-shops, and other adjuncts usually found ready and at hand. The bolt-iron required was collected piecemeal from every quarter,—New Orleans, Macon, Mobile, Chattanooga, and elsewhere. The building timber was still in leaf, and had to be transported, when felled and sawed, from various points in an area a hundred miles around. The Confederacy was scoured for iron-workers who were willing or able to roll the plates for the casemate, until a contract was made at last with an establishment at Atlanta, which had to change its rollers for the purpose, but the scarcity of iron had nearly balked this arrangement. The manufacture of the engines was perforce committed to establishments already overtaxed by private work and army contracts. Next to the machinery, the most important object was the shafting for the propellers. It was essential for the security of the vessel that this should be of wrought iron. It is a striking evidence of the nakedness of the land in regard to naval necessities that in the whole Confederacy there was not a foundry competent to make the shafting.

When at last the inventors seemed to be driven to the sorry expedient of substituting cast- for wrought-iron shafts, they were fortunate enough to induce a party in New Orleans who was putting up an air-furnace and forging a large steam-hammer for the purpose of making Armstrong guns for the government, to adapt these appliances also to making the shafting. The two side or quarter shafts were thus made at New Orleans, and the central one was manufactured at Richmond, from a wrought-iron shaft recovered from a burnt ship.

Superadded to all these difficulties were strikes of laborers for higher wages, delays in the delivery of timber from contractors, and financial troubles from want of proper arrangements at Richmond.

The first plank of the new vessel was laid on the 14th of October, and, with little exception, a force varying from 500 to 600 men, stimulated by liberal wages and jealously watched by the committee of safety of the city, were kept working on her from that day forward.

Anxiety to avoid interruption in the work induced the Tifts, with the concurrence of the naval authorities on the spot, to postpone launching the ship to the last moment. This solicitude proved fatal in the end.

The enemy's preparations for the descent on New Orleans began at Ship Island in the latter part of February. In March the fleet had mustered at the mouth of the river, with many of the heaviest ships over the bar. The ability of war-ships to run successfully past shore batteries had been too frequently exemplified to admit of question. Such was the opinion of military and naval men at New Orleans at the time. The inadequacy of our naval force to cope with the enemy was also apparent. The first and most effective obstructions stretched across the river had been swept away by the spring freshets, and gaps had been made by drift-wood in those that had been substituted. All these admonitory considerations, which it might have been supposed would have quickened the action of the Confederates into immediate efforts to save a vessel so formidable and so invaluable as the "Mississippi" by taking her in time to some secure retreat, failed to produce any serious impression. Yazoo River offered a temporary refuge at least, and Vicksburg was still in our possession with foundries and machine-shops available for continuing the work. But one dominant idea seems to have filled the mind of the Tifts, who, by special orders, had exclusive charge of the vessel until delivered over for service,—that of pushing forward the work; and this all-engrossing purpose closed their eyes to the palpable danger in which she stood from the menacing attitude of the enemy.

Though sufficiently advanced for launching long before, it was not until the bombardment of the forts by the mortar fleet had begun that she was put afloat. The first attempt to accomplish this was made on the 17th of April, and proved abortive. Three powerful steamboats attached to her broke their connecting hawsers in the fruitless effort to pull her off the ways. At last it was discovered that she had been bolted to her bed by some treacherous hand. This impediment being removed, she glided into the river on the following day almost of her own volition. It would not yet have been too late to save her. Between the 18th, when she was launched, and the 25th, when the enemy reached the city, ample time and means were at hand to send her up the river, but the golden opportunity was not improved. She was still allowed to lie at the wharf with the work upon her going on, perhaps with more intense earnestness and pressing dispatch, but as serenely as if Farragut's fleet were a thousand miles away instead of storming at the outer gates of the city.

At last, at early daylight on the 24th, the startling intelligence came that the great body of the fleet had passed the forts and was swiftly steaming up the river. The news fell like a clap of thunder and produced general consternation, followed by a relaxation of all police restraints, during which the dregs of the populace abandoned themselves to violence and plunder. It was in the midst of this riot and uproar that the hot and hurried attempt was at last made to save the "Mississippi." But it was now too late. Commander Sinclair, who had been assigned to the command, took her out of the hands of the builders. The day was passed in freighting her with building materials. At about 8 P.M. he started up the river under tow of two steamboats, but a freshet was prevailing at the time, and half the night was consumed in vain efforts to stem the rapid current. Midnight found the fated vessel again at her old moorings. Early the following morning, when every attempt had failed to obtain additional steam-power, and when the Federal squadron was in full view, the case had become hopeless, and the "Mississippi" was committed to the flames to save her from the hands of the enemy.

The "Mississippi" was 260 feet long, with an extreme breadth of 58 feet and a depth of hold of 15 feet. Her casemate sloped at an angle of about 36° to the horizon. The upper slopes

were covered with three plates of iron 1¼ inches thick, each disposed in two horizontal courses below, making joints covered by the upper or bolting course running vertically. The lower slopes had two courses of the same thickness crossing each other, the one beneath running lengthwise, and the sides of the ship between these slopes had a double layer of plates placed lengthwise. The level portion of her shield or upper deck was spread with iron plates 1¼ inches thick. She was pierced for 18 guns. Her intended battery was a mixture of 7½-inch and 10-inch rifles. Her engines were horizontal, with cylinders 36 inches in diameter, with 2½ feet stroke of piston. She was fitted with 10 double-flued boilers in two different sets, 30 feet long each, and 3 propellers, whose shafts, 9 inches in diameter, were, the central one 50 and the others 40 feet in length. She was calculated for a draft, when fully equipped, of 14 feet, and speed in smooth water of from 12 to 14 knots, and was adapted for sea as well as harbor and river service.

The "Arkansas" we have already referred to as the vessel that was conveyed from Memphis to the upper waters of the Yazoo for completion. Like the others, she had a sloping shield, which was covered by iron rail (double T), and her battery,—but in this we may be subject to correction,—we believe, consisted of 10 rifled guns of 8-inch calibre.

Commanded by Commander Brown, this vessel issued from her river fastness, protected by a barricade of rafts and a small battery, on the 15th of July, 1862, bound to Vicksburg. Near the mouth of the river she met, as had been anticipated, a reconnoitring expedition of the enemy, consisting of the "Carondelet," a Western ironclad, armed with 8- and 9-inch guns and one 100-pounder rifled, the wooden gunboat "Tyler," and the ram "Queen of the West," unarmed, but manned with a crew of sharpshooters. The engagement which followed was sharp and brief and very destructive to the enemy, whose shot and shell were wasted on the shield of their antagonist. The shattered and almost disabled vessels ran for shelter to the combined squadrons of Farragut and Davis, which lay directly on the road to Vicksburg, followed by the "Arkansas," which dashed through this formidable barrier without a moment's hesitation, receiving, unharmed and at point-blank range, the fire of their 9- and 10-inch guns, and delivering her own broadsides with fearful effect. Before the Federals had fairly recovered from the bewilderment of the sudden and unexpected onset she had dropped her anchor under the Vicksburg batteries unharmed in hull or crew. On the other hand, in these rapid encounters, which occupied but a few minutes each, the enemy, besides the damages sustained by their ships, suffered a loss in killed, wounded, and missing of 78 men.

A few hours after the battle the Federals, under the cover of a dark night, made a desperate attempt to destroy the "Arkansas" in spite of the batteries protecting her, but were successfully repulsed. The attack was renewed on the night of the 22d with the same result.

The career of this vessel was destined to be brief. While on her way, on the 5th of the following August, to co-operate with Gen. Breckenridge in an attack on Baton Rouge, she was disabled when she had reached the bend above that place by the breaking down of her port engine. It was patched up with such means as were at hand, but the engineer would not guarantee that it would last more than half a day. The next morning she started from her anchorage with the immediate purpose of attacking the "Essex," which was seen approaching up the river, when her starboard engine gave way. Being thus rendered helpless and unmanageable in full sight of the enemy, her destruction was the only means left to prevent her capture. She was accordingly run on shore and set on fire by the officer then in charge, Lieut.-Commander Stevens, the officers and crew making their escape.

The impression made upon the Federals by the exploits and formidable character of the "Arkansas" is pithily expressed in a letter of Admiral Farragut to the Secretary. "It is one of the happiest moments of my life," writes the admiral, "that I am enabled to inform the Department of the destruction of the ram 'Arkansas.'"

It is not our purpose to follow up the naval preparations in detail. They began mostly with the construction of wooden vessels, for the American mind had been so little occupied with ironclads that the most enlightened among the officers knew little on the subject. It was Maury who proposed the first vessels that were built, and he rejected the suggestion that they should be mailed with iron. The idea, however, gradually gained ground, and at length the success of the "Virginia" in the battle of Hampton Roads determined the policy of the government. Thereafter all the naval engineering skill and mechanical labor that could be commanded was devoted to the construction of armored vessels. They were built at every available point,—Charleston, Wilmington, Richmond, Savannah, and on inland waters of the Carolinas, Alabama, and Georgia. As the work progressed, marked improvements were made on the original models. The submerged ends and knuckles, the characteristic feature of the "Virginia," were dropped out of the future plans or considerably modified, but the sloping shield prevailed in all the structures. In three instances the batteries were placed in low citadels plated with 6-inch iron. The vessels were generally built by contract with private parties, the government agreeing to furnish the metal for armor, engines, and shafting; these were supplied by the naval works at Richmond, Charlotte, and Columbus, and the armaments, projectiles, and all objects of pyrotechny were prepared by the ordnance establishments at Selma, Charlotte, and Atlanta, or Augusta after the last place had fallen. We have already more than once adverted to the scarcity of iron. During the whole construction of these vessels the want became more and more urgent. Finally by the fall of 1864 the last supply of that metal had been consumed, leaving on the stocks 12 vessels completed but for their armor, which would have required 4230 tons that never was obtained. This brought the construction of that class of vessels to a final close. The number which had been completed and commissioned up to the 24th of November, 1864, was 25. Of these, 9, at that period, had been lost to the Confederacy,—viz., 2 by casualties, 4 burnt by their

own commanders to prevent capture, 2 captured, and 1 destroyed by the enemy.

The number of wooden vessels of all classes and descriptions within the waters of the Confederacy fluctuated so much from month to month that it would be hazardous to state it positively without more reliable data than we have on hand. Probably they never amounted to more than 50 at any one time. The Confederate navy had also a peculiar class of boats fitted for submarine and torpedo service, which, under the charge of officers who devoted themselves to that specialty, proved a valuable auxiliary, not only for its capacity to inflict sudden and unexpected damage, but for the dread and distrust it inspired. In July, 1863, the Federal steamer "De Kalb" was sunk by a torpedo in Yazoo River. In April, 1864, the "Squib," a small torpedo-boat, darted unobserved under the cover of night through the Federal fleet off Newport News and exploded one of these engines under the bilge of the "Minnesota," greatly damaging the vessel without destroying her. In May an expedition of the enemy ascending James River was retarded in its advance to the speed of a half-mile per hour by the necessity of scouring the banks of the stream and dragging its bottom to clear the path of these dangerous impediments, and was finally diverted from the intended descent on Richmond by an explosion under the bottom of one of the leading vessels, which was hurled into fragments. And it is an event to be remembered how, in August, 1864, the monitor "Tecumseh," in the midst of the fleet standing into Mobile Bay, vanished, as it were, from the face of the waters with every soul on board by coming in contact with one of the torpedoes strewn in the channel.

From what has preceded it may be seen that by the fall of 1864 the Confederate navy had reached its maximum. To recapitulate, it possessed then 16 ironclads, 3 of which were rated floating batteries, 50 wooden vessels (assumed), and 1 cruiser, the "Shenandoah," on the high seas. This final result of all the labors of preparation falls signally short of that foreshadowed by the letter of the Secretary of the Navy of May, 1862, but, considering the delays and difficulties and reverses that were encountered, and which we have but inadequately described, it is a proof of wonderful vigor and enterprise that so much could have been accomplished.

The general policy of the South throughout the war was to act on the defensive. So far as the navy was concerned, no other could have been pursued. Both the character of its vessels and their limited number rendered any systematic course of aggression impossible. The armored boats were adapted only for operating in smooth water, and the whole force was necessarily divided into detachments, occupying the most important points of defense, where each command was kept at bay by the superior strength of the enemy. The Confederacy was therefore compelled to submit to the humiliation of a continuous blockade without the power to raise it, its vessels for the most part lying idly at their anchors and passively awaiting events, with steam up and fires banked ready for the emergency when it should arrive.

This state of things afforded but little scope for enterprises of any magnitude, but frequent opportunities occurred or were made for striking a blow by means of special expeditions.

The first ironclad employed by the South was a vessel of some power called the "Manassas." She was originally a ferry-boat, and was transformed into a ram by a private company in New Orleans by the addition of a casemate faced with iron ¾ inch thick, and an iron prow 10 feet long. She swam low in the water, and carried a 60-pound Dahlgren gun. The owners lent this vessel to Commodore Hollins for an attack on the blockading force in October, 1861, then consisting of the sloops "Vincennes," "Preble," "Water-Witch," and "Richmond," all lying inside of the Southwest Pass.

With the addition to his flotilla of razeed river boats, 5 in number, and carrying 11 guns varying from 24-pounders to 8 inch columbiads, Hollins, having secretly made his preparations, carried the enterprise into effect on a night so profoundly dark that objects were not visible 20 yards ahead. Issuing from between the Forts Jackson and St. Philip, the little squadron, with the "Manassas," Lieut.-Commander Wharley, in the lead, dropped down the river so quietly that the surprise was complete. The crash of the ram as she buried her prow into the first vessel that could be discerned, which proved to be the "Richmond," followed by an appalling cry that rang out from the apparently sinking vessel, awakened the whole fleet to its first sense of danger. Fortunately for the "Richmond," her assailant suffered from the shock almost as much damage as she inflicted. Her prow was badly twisted, and one of her engines disabled. In this crippled condition the ironclad found herself carried by the current all alone into the midst of the squadron, and, exposed as far as the darkness permitted to its concentrated fire, she would have fared badly, but, throwing up a rocket, the concerted signal, the fire-barges came sweeping down in full flame upon the Federals, followed by the flotilla, and caused a general stampede. The "Richmond," though with a great hole in her bow, contrived to keep afloat, and daylight disclosed the dispersed blockaders far down within the Southwest Pass, with two of their vessels stranded on the middle ground. The Confederates stood down the Pass within range, and the little drama was closed by a distant cannonade, in which neither party suffered further damage. The "Manassas" had so well acquitted herself on this occasion that she became the property of the government by purchase.

The first great naval triumph of the South was the victory achieved by the ironclad "Virginia," in the memorable battle of Hampton Roads, on the 8th of March, 1861,—an event interesting not only for the immediate issues involved, but as introducing a new element in naval warfare, and inaugurating a revolution in the means and methods of future encounters.

The "Virginia" was the first naval structure of any magnitude invulnerable to shot and shell that was ever launched upon American waters, if we except "Stevens's floating battery," designed for the protection of New York, the keel of which was laid in 1845. She was originally the "Merrimac" of the Northern service, and had shared in the general conflagration of the men-of-war at the Gosport Navy-Yard, when

the effort was made to destroy that depot by a party under the command of Commander Paulding in April, 1861. She had been scuttled as well as set on fire on that occasion, but on raising and docking her it was found that the destruction had not extended below the water-line, and that the vital portions of her engine had escaped intact.

The design for converting the wreck of the old steam-frigate into an ironclad ram was furnished by Commodore Brooke, the naval chief of ordnance, who also devised the powerful guns of her battery. She was about 300 feet long, with about 55 feet beam. The chief characteristics of the new form she was made to assume as an ironclad were an armored casemate, sloping at an angle of 45°, and the submergence 2 feet below the surface of the water of her entire hull proper. The casemate was constituted by a wooden backing 7 inches thick, covered with two layers of wrought-iron plates, each 2½ inches thick, disposed horizontally and vertically one above the other. She had in addition a cast-iron stem or prow projecting 4 feet, and somewhat in the shape of a hog's head. Her general appearance suggested the roof of a house, or perhaps a rope-walk, floating on the water with its eaves immersed. Her armament consisted of two 7-inch Brooke rifles, one forward and the other aft, with a broadside of two 32-pounder Brooke rifles, and six Dahlgren 9-inch shell-guns. When she was fitted out, as the pressure for the supply of projectiles was very great on the ordnance department, and it was not expected that she would have any but wooden vessels to encounter, she was not supplied with solid shot or bolts.

The peculiar structure of the "Virginia" involved new and untried conditions affecting her speed, steerage, and general manœuvring which there was no opportunity of testing. The ship was begun the latter part of June, 1861, completed the latter part of February, 1862, and hurried into action the moment she was equipped. In point of fact, her experimental trip was made when she plunged into battle.

The Federals had been watching with no little concern the work as it progressed on the "Virginia," while hurrying at the same time to completion the "Monitor," of which we shall directly have occasion to speak. Meanwhile, a powerful fleet had been mustered in the waters near Fortress Monroe and Newport News, one of whose principal objects was to intercept and destroy the "Virginia" as soon as she should make her appearance,—a task which with such a force might, before the unhappy experience of the 8th of March, have been reasonably deemed easy to accomplish. The Federal squadron consisted of the steam-frigates "Minnesota" and "Roanoke," of 50 guns each, the sailing-frigates "Congress" and "St. Lawrence," of 50 and of 12 guns respectively, and the sloop-of-war "Cumberland," of 24 guns. The guns were all of 8- or 9-inch calibre, and made in the aggregate 186 broadside pieces, in addition to which were several 10-inch guns on pivot. This force of the enemy was further swelled by six or seven steam-gunboats heavily armed.

Everything seemed propitious when the "Virginia," bearing the broad-pennant of Commodore Buchanan and accompanied by two small steamers, the "Beaufort" and "Raleigh," of 1 gun each, at 11 A.M. started from the Gosport Navy-Yard to encounter the enemy. The sky was bright, the water smooth, the hostile vessels within easy reach, and the officers and crew cheerful and confident. And yet at the moment the success of the enterprise could by no means have been held as certain. The ironclad had yet to prove her invulnerability, and the ordeal in prospect was a formidable one. The Federal squadron was divided into two bodies; the "Minnesota," "Roanoke," and "St. Lawrence" lay near Fortress Monroe, and the "Congress," with the "Cumberland," was anchored off Newport News, so that, whichever field of battle was chosen, it was not only the guns afloat that were to be met, but those on shore.

A part of the Confederate fleet, the "Patrick Henry," of 12 guns, the "Jamestown," of 2, and the "Teazer," of 1, at this time were waiting, a little inside of the mouth of the James River, the first shot from the "Virginia" as the signal to run the gauntlet of the batteries at Newport News and take their share in the fight. The accession of these vessels would swell the number of Confederate guns to 27.

Buchanan reached Sewell's Point at 1 P.M., and found the enemy, who had caught sight of his smoke, on the alert in both directions. Doubling round Craney Island flats and taking the lead he selected the "Cumberland" as the first object of attack, between which vessel and the Confederates there lay a clear reach of about 3 miles of unobstructed water. He bore directly down on that ship, and, notwithstanding the "Congress" lay close to his path, held unflinchingly to his course till he struck her. As he came within easy range of the "Congress" he opened the battle with his bow-guns charged with grape, which flew over her or lodged in her sides without much damage. This drew from her a full broadside when the two ships were about 1200 yards apart. Her shell burst against the armor and fell in fragments, and her solid shot glanced or rebounded and tumbled into the water; both were as harmless as would have been a shower of paper bullets. The return broadside of the "Virginia" was terribly destructive, crashing through the wooden sides and slaughtering a large number of the crew.

Still holding steadily to her course, she pushed onward and past the "Congress," and, receiving the same ineffectual fire from the "Cumberland," poured into her as she approached the contents of her bow-gun, which raked her fore-and-aft and literally mowed down the men in heaps as they stood at their quarters. The next moment, in the midst of this frightful carnage, the ironclad, with the impetus of a full head of steam, plunged headlong into the bows of her antagonist with instantaneous and decisive effect. The crash of the rending planks and timbers was distinctly heard in the midst of the roar of guns and the reverberations of the armored casemate on which the missiles were playing as upon an iron drum. The "Cumberland" was a helpless wreck from that instant. As the "Virginia" withdrew from the contact she left a great breach behind, into which the water gushed in torrents, and the hapless ship began at once to settle. In a short time she heeled over and sank, grounding at a depth of 50 feet with nothing visible left but the tops of her mast and her flag still flying. The contest, though so unequal, had

been as desperate as it was brief. The firing from both ships had never ceased from the beginning to the end of the encounter, and—be it said in all honor to the heroic defenders of the Stars and Stripes—the last shot from the sinking ship came from guns that were about dipping their muzzles in the water. So rapid had been the destruction of the "Cumberland" no time was afforded to save the wounded, and those incapable of helping themselves were carried to the bottom. The rest of the crew jumped overboard as the ship went down, and many were drowned before being reached by the boats which were sent from Newport News to their rescue. Out of a complement of 376 men, officers and crew all told, 117 were lost and 23 missing.

While the "Virginia" was thus proving her resistless power on the "Cumberland," the "Beaufort" and "Raleigh" were each playing their single rifled piece upon the "Congress" with quick and sharp results, the odds against them being largely compensated by their ability through steam-power to choose distance and position as well as by the larger and fixed target the enemy presented.

As the "Cumberland" disappeared from the scene the Confederate vessels hove in sight in rapid approach from James River. They dashed through a storm of shot and shell, grape and canister, poured into them from the batteries of Newport News, in which the "Patrick Henry" in the loss of a few men was the only sufferer, and joined the two small steamers in the attack on the "Congress." Meanwhile, to escape the fate of her consort that vessel, with the help of her topsails and a tug-boat, had contrived to put herself in shoal water, where she grounded.

While all this was going on Buchanan was manœuvring for the best position to turn his guns on the "Congress." This was a matter of no little difficulty in the contracted space of the theatre of the combat with a vessel of the length and draft of the "Virginia," so that he was compelled to run past the batteries of Newport News for a more roomy area in the mouth of the James, in order to put her head in the proper direction. The "Congress," mistaking the movement for a withdrawal from action, gave three cheers. The shore batteries opened a furious fire during the ironclad's passage to and fro in close proximity. The pounding she endured did not start a single rivet or bolt of her armor. Her return fire silenced some of the batteries, blew up a steamer at the wharf, and sank a schooner.

The fate of the "Congress" was now swiftly determined. The "Virginia" took a raking position under her stern at a distance of about 200 yards, and delivered her shot and shell with all the deliberation and precision that might have attended a holiday practice. The "Congress" had thus the concentrated fire of the whole squadron upon her, which she endured to the last moment. It was not until her whole broadside batteries were disabled and her crew were rapidly falling in every discharge from the enemy that two white flags were displayed, one at the gaff and the other half-masted at the main.

This gave a momentary pause to the havoc. The "Beaufort" and "Raleigh" were dispatched with orders to take possession, make prisoners of the officers, allow the crew to land, and burn the frigate. While in the execution of this mission, and while the white flags were still flying upon the conquered ship, a fire was opened upon those vessels from the shore batteries. This took place after the formal surrender of themselves and of their vessel had been made on board of the "Beaufort" by the commanding officer and executive, who, at their own request, had been temporarily released to assist in having the wounded transferred to the two steamers. Those vessels were thus compelled to leave, and made their way to Norfolk with such of the wounded as they had received.

Buchanan now sent a boat in charge of Lieut. Minor, convoyed by the "Teazer," with orders to set fire to the "Congress," but was baffled in this fresh effort by a renewal of volleys from the enemy upon the party, under which some lives were lost and Minor was wounded. Finally, under these repeated provocations, he determined to effect his object by incendiary shot. This was soon accomplished, and the "Congress," which had been abandoned by her officers and crew, who saved the wounded in their retreat, was speedily wrapped in flames and reduced to fragments as soon as they reached the magazine.

Leaving the burning vessel to her fate, the "Virginia," with the "Patrick Henry" and "Jamestown" in company, next proceeded to attack the "Minnesota." That vessel, manœuvring in shoal water to avoid the direct onset of the ironclad, had run aground, and was now a firm and fast fixture about 2 miles from Newport News on the north side of the North Channel. With the "Roanoke" and "St. Lawrence" she had come late into action, in which they engaged at long range.

The attack on the "Minnesota" occupied the three closing hours of that eventful day. The "Virginia" opened her fire, but without serious effect, at a distance of about 1 mile from the enemy, the nearest point she could reach. The rifled guns of the "Patrick Henry" and "Jamestown" were now telling and did considerable damage. The only gun the "Minnesota" could bring to bear was her 11-inch gun on pivot.

Night at last put an end to the contest. The Confederates, satisfied that the shoal would hold fast the frigate till next day, doubled the west end of the middle ground and made their way for anchorage under Sewell's Point, merely pausing to give her a parting broadside as they came abreast of her in their passage thither.

About 9 o'clock in the evening of that exciting day the worsted Federal squadron, or what was left of it, was cheered by a new and important accession to its force in the arrival of the "Monitor." The fame of that iron vessel had preceded her, and her arrival at so opportune a moment was as welcome as it was unexpected. She was built after a design and plan devised by the distinguished mechanician Ericsson, and had no antetype in any known naval structure. She was smaller, lighter, and from her inferior draft and greater mobility was infinitely more manageable, than the bulky competitor against which she was about to be pitted. She swam the water at a depth that brought her metallic spar-deck flush with the water, and offered no mark to the shot of the enemy but a revolving central citadel 10 feet high and 20 in diameter, surmounted by a pilot-house in the form of a low turret, and concentrating within its imper-

vious iron walls her whole battery, which consisted of two 11-inch rifled guns.

The contest under this change of conditions was renewed early in the forenoon of the 9th, the "Virginia" now commanded by Lieut.-Commander Jones, who had succeeded Buchanan, disabled by a severe wound the previous day. The "Virginia" was again supported by the "Patrick Henry" and "Jamestown."

The combat was of a novel and striking character. It resolved itself largely into a duel between the ironclad and the "Monitor," the one cumbrous and heavy, dragging at times in the mud owing to her great draft, and requiring a free scope for effective evolutions, but fighting in a very restricted space; the other of light draft, agile, and buoyant, and turning round in an area whose diameter might almost be measured by her own length, while each vessel was impenetrable to the missiles of the other.

The efforts of the "Virginia" were mainly directed to two objects, viz., to sink her antagonist by running her down and to improve every opportunity to hurl her shot into the "Minnesota," still lying helplessly aground. The "Monitor," on the other hand, while not declining an engagement at close quarters, aimed at manœuvring so as to elude an onset that might be fatal, and, while endeavoring to crush the armor of the "Virginia" with her heavy 11-inch guns, at the same time sought to maintain a position that would most effectually cover the stranded frigate.

Twice the "Virginia" succeeded in running into her, but not with the required impetus or a stroke sufficiently direct to effect her purpose. The buoyancy of the struck vessel saved her: she glided from beneath the blow and swam as upright as ever.

During the action the "Minnesota" was very much cut up in spite of the interposition of the "Monitor." One shot especially from the bow-gun of the ironclad produced great havoc, battering down her bulkheads and in its passage along her decks exploding cartridges, which set her on fire. The next shot blew up a steamer alongside of her. The rifle-guns of the two steamers did also their part in crippling her.

On this occasion the "Minnesota" was able to employ her broadside guns, which in one instance, were leveled against her adversary at point-blank range, but they might as well have been discharged in the air. In the midst of the battle the ironclad ran on shore. With her massive dead weight the position was a critical one, but luckily she was backed off before any advantage could be taken of the accident.

The struggle between the combatants was maintained with desperate earnestness on both sides without other results than those noted, when the Confederate commander thought it useless to protract it. He was unprovided with solid shot or bolts which might have proved effective against the citadel of the "Monitor," on which his shell could make no impression, and that vessel had retired to shoal water beyond the reach of attack by ramming. The "Minnesota" was also inaccessible to close approach, and believed to be entirely disabled. There was, therefore, nothing left to accomplish, and about noon the Confederate squadron left for Norfolk to repair such slight damages as they had sustained during the two actions.

Indeed, the damage, considering the pounding to which the "Virginia" had been exposed, was so inconsiderable that the hopes of the most sanguine as to her powers of endurance were more than realized. A shallow indentation on two of her plates was the only mark left upon her armor; her steam-pipe and smoke-stack were riddled, two of her guns were shorn of their muzzles, her anchors were lost, her stem twisted, and her prow was left in the breach it had gored in the bows of the "Cumberland." Thus in a short time every repair was completed, and supplied with solid shot and bolts, she made the tour of Hampton Roads in the hopes of testing them on the "Monitor," but no engagement followed.

The question of the value of ironclads for harbor defense as compared with wooden vessels was determined in Hampton Roads at once and forever. In the two actions the entire loss of the "Virginia" was 2 killed and 17 wounded. The disastrous result to the Federals may be summed up as the complete disablement of one frigate and the destruction of another, with a first-class sloop, and the aggregate loss on board of the two latter vessels of 255 killed and 23 missing. The loss on board of the disabled vessel, which must have been considerable, we have no means of ascertaining.

We have been led to dwell at some length upon the actions in Hampton Roads by the novel and remarkable expedients that were first employed in these contests. The "Virginia" came out of the conflict a historical ship. In all future narratives of naval war she will loom up conspicuously as having determined a new line of development in naval forces leading to a complete revolution in the naval systems of the whole world, as well as those of coast and harbor defenses. The triumph of that vessel was a brilliant one, but short-lived. The story of her final fate is soon told.

When the exigencies of the war compelled the evacuation of Norfolk, the "Virginia," now under command of Commodore Tattnall, was left in a critical position. She had no means of sustenance except a limited supply, and no means of renewing that supply when exhausted. She was lying near Craney Island, and merely mistress of the waters within reach of her guns for a few uncertain days.

In this dilemma Commodore Tattnall, on whom the government seemed to have silently cast the responsibility of disposing of the ship, determined if possible to reach Richmond. One obstruction only lay in his way, but that was formidable. A shoal, on which at the top of the flood there were 8 feet less water than his vessel drew, stretched across the river a little above City Point. The pilots promised to tide him over safely if he could reduce the draft, which was at the time 22½, to 18 feet. In the emergency nothing was left but to make the attempt. Every object of weight except what was actually necessary for defense was cast overboard to lighten the ship; shot and shell, chains, anchors, water, coal, provisions, all followed one another into the river. But all was of no avail. The ironclad rose out of the water until her draft was lessened to 19½ feet, and there she stood with all the movable heavy material out of her and a broad streak of unsheathed bottom resting above her water-line. The alternative then presented itself of a certain capture by the enemy,

even by blockade, within a time that might be calculated, or her destruction. A council of war decided that she should be burnt, and the career of the "Virginia" was thus closed on the morning of May 11, 1862.

If, after the fight of the "Virginia," the value of ironclads for harbor defense required any confirmation, it was amply supplied by the extraordinary display of endurance exhibited by the "Tennessee" in her engagement with the Federal squadron in 1864.

That vessel was in round numbers 209 feet long by an extreme breadth of beam of 48 feet, and drew on the average 14 feet water. She was built of a combination of yellow pine and oak. The sides of her hull proper were about 8 feet thick from knuckle to keel, and protected by sponsors coated with a double layer of 2-inch wrought-iron plates. These defenses dipped 5 feet below the water-surface, and terminated forward in a stout iron-sheathed beak projecting from the bow at 2 feet under water.

The casemate was 79 feet long by 28 feet wide in the clear, leaving unoccupied a considerable margin of waist-deck on either side of its base and the entire quarter-deck, both of which were sheathed with 2-inch wrought-iron plates. The framing was a marvel of strength and solidity. It consisted of heavy yellow pine beams closely joined together in a vertical position, with 5½-inch planking of the same material laid on horizontally outside, on which again was a layer of 4-inch oak timber bolted on vertically; added to all was an inside lining of 2½-inch oak planking applied diagonally, the whole constituting a backing to the wrought-iron armor, 25 inches thick. The armor was secured by bolts passing through the entire mass. It was 6 inches thick on the forward slope, and consisted of two courses of plates of equal thickness; on the side slopes and at the rear three courses of plates were laid, two of which were 2 inches thick covered by one of 1 inch thickness.

The casemate had a flat top consisting of heavy wrought-iron grating, in which hatchways were contrived by swinging portions of it on hinges so as to open outwardly. The port-holes, 10 in number, two on either broadside, three aft, and three forward, were horizontal apertures long enough to give free scope for training the guns, but affording little space for elevation or depression.

The battery of the "Tennessee" consisted of 6 rifle Brooke guns, two of which were 7½-inch bore, mounted one forward and one aft, and four 6-inch bore, carried two on each side. The projectiles were 95 pounds in weight and the solid shot 110 pounds.

The pressing urgency for the services of this vessel caused her to be equipped with the utmost dispatch, which may account for a remarkable oversight in the arrangement of her steering-gear, which, as we shall see in the sequel, was the proximate cause of her capture. No leisure was left for trial-trips and such corrections and improvements as those tests would have suggested. Her crew were generally raw and inexperienced. Seamen were so scarce in the Confederacy that they formed but a small fraction of her ship's company. These observations apply equally to the 3 third-class wooden steamers forming, with the "Tennessee," the squadron under the command of Admiral Buchanan at Mobile, viz., the "Morgan," Capt. Harrison; "Gaines," Capt. Bennett; and "Selma," Lieut. Commanding Murphy. The "Morgan" and "Gaines" mounted each six 6-inch rifle-guns, and the "Selma" four guns of the same description. The aggregate force of the squadron was 470 men and 22 guns.

On the morning of the 5th of August, 1864, this small fleet was waiting under the guns of Fort Morgan, in Mobile Bay, the encounter with the Federal squadron of 18 ships, including 4 monitors, manned by 2700 men, and mounting in all 199 guns, which ranged from 9 to 15 inches in calibre, and threw projectiles varying in weight from 84 to 428 pounds.

The bare statement of the immense disparity between the antagonistic forces foreshadows the inevitable result of the conflict we are about briefly to sketch.

The Federal squadron was commanded by Admiral Farragut. It consisted of the 4 monitors already referred to, the "Tecumseh," "Manhattan," "Winnebago," and "Chickasaw," the two first armed each with two 15-inch guns, and the others each with four 11-inch guns, and 14 steamers, viz., the flag-ship "Hartford," 28 guns, "Brooklyn," 26, "Octora," 10, "Metacomet," 10, "Richmond," 24, "Port Royal," 8, "Lackawanna," 14, "Seminole," 9, "Monongahela," 12, "Kennebec," 5, "Ossipee," 13, "Oneida," 10, "Galena," 14, and "Itasca," 4 guns.

The preparations of the enemy for battle, from all accounts, embraced every expedient that the most wary foresight could suggest for putting each vessel in the best possible defensive condition. Besides the customary precautions in such cases, the steering-wheels were barricaded with sails and hammocks, the hurricane-decks spread with sand-bags to protect the machinery underneath, while chain-cables, snaked in close fakes up and down the sides, converted each wooden vessel for the time being into quasi-ironclads.

The squadron passed over the bar at the mouth of Mobile Bay at early daylight of the day stated, and steamed midway up the main ship-channel, which ran, at the nearest point, within about a half-mile of Fort Morgan. It was ranged in an order of battle of one compact line, headed by the monitors, with the "Tecumseh" in the lead, followed by the wooden vessels, lashed two abreast, with the side-wheel steamers on the off-shore or port side of their consorts. The "Brooklyn" was the advance ship at starting of the wooden vessels, the "Hartford" following in her immediate wake.

As the force drew near Fort Morgan the "Tecumseh" opened the drama by a single shot, which was returned by a volley as the wooden ships came in closer range. The battle then began in earnest, with a furious cannonade on both sides, each ship plying her bow-guns until sufficiently advanced to make her broadside available, and the fort, in its turn, maintaining a steady and destructive fire through the hail of shot and shell that was making considerable havoc among the gunners at the embrasures.

The flag-ship and the "Brooklyn" were the severest sufferers under the fire, both losing a number of men. A startling event occurred soon after the engagement, which might have dis-

turbed the equanimity of a less resolute man than the chief of the squadron. The "Tecumseh," at the moment some 300 yards in the lead, ran upon a torpedo, and disappeared almost with the suddenness of an apparition, carrying down nearly the whole ship's company of 123 men, including the commander.

Almost upon the heels of this thrilling incident, the "Brooklyn," in order to avoid a supposed nest of torpedoes, as indicated by buoys, nearly under her bow, reversed her engine, and commenced backing, at the risk of throwing the whole column into confusion at a critical juncture. The danger was averted by the "Hartford" promptly dashing to the head of the line and running safely over the suspected spot. By these manœuvres the flag-ship and the "Brooklyn" interchanged positions.

As the enemy was about emerging from under the fire of the fort, he met the Confederate fleet drawn up in mid-channel behind a line of torpedoes, which, probably from having been too long submerged, proved of no service in checking him.

The "Tennessee," supported by 3 gunboats, began the battle by opening upon the flag-ship at about 6.30 A.M., and followed up the attack by bearing down upon her antagonist at full head of steam, in the hopes of sinking her. The alertness and superior speed of the "Hartford" saved her. She steamed ahead untouched. Baffled in this purpose, the ironclad swept round in a wide circle to gain a proper heading and impetus to repeat the attempt upon the "Brooklyn," the next ship in the line. The second attempt was equally fruitless and owing to the same cause,—the superior fleetness of her intended victim. Meanwhile, the guns were vigorously plied on both sides, while the Federals still advanced in unbroken column up the bay in the direction of a pocket of deep water known as the "Lower Fleet."

The Confederate gunboats, comparatively frail structures at best, and bare of all supplemental defenses, gave no very cheering promise of being able to render effective support to their chief against such heavy odds; but they were handled skillfully and served their rifle-pieces with spirit and effect. One shot alone from one of them, according to the official report of the enemy, killed 10 men and wounded 5 at number one gun on board the "Hartford."

The "Gaines" was the first one of the three put *hors de combat.* She kept up an active attack for some time upon the whole line while steering in courses nearly parallel with the advancing fleet at distances gradually diminishing, which at last brought her within short range of some of the heaviest vessels. Finally a shot under her counter, combined with the concussion of a shell that exploded under her bilge, closed her career, and her commander had barely time to put his sinking vessel about and reach the beach near Fort Morgan, where she was stripped of all valuables and abandoned.

The "Morgan" used her guns to great advantage by keeping well on the bows of the "Hartford" and delivering raking fires, and had a slight brush with the "Metacomet." She sustained no serious damage in the conflict, and was preserved to the Confederacy by running the gauntlet of the enemy's squadron under the cover of night and reaching Mobile in safety.

The "Selma," after the loss of two of her best gunners, and with two of her four guns already disabled, was attacked by the "Metacomet," carrying eight 9-inch Dahlgrens, and two 100-pounder Parrott guns, and after a brief but spirited contest, attended with the additional loss of 6 killed and 7 wounded, succumbed to the superior force of her enemy.

After the capture and dispersion of the gunboats the battle assumed a new phase, and was one of the fiercest ever recorded in naval annals. At this juncture the "Tennessee," by reason of her evolutions and sluggish movements, found herself far astern in the neighborhood of Fort Morgan. From this point Admiral Buchanan started on the desperate venture of engaging single-handed the entire Federal squadron. The act was a splendid specimen of naval intrepidity, but it almost provokes the terse criticism of Count Von Moltke upon the famous charge at Balaklava, "C'était beau, mais ce n'était pas la guerre."

The approach of the "Tennessee" awakened anew the enemy, who had in the mean time anchored in the "Lower Fleet," into animated movement. Every anchor was at once lifted, and every preparation made to give the ram a warm reception. At length the "Tennessee" steamed into their midst, dealing fearful destruction with her shot and shell as fast as her battery could be served, yet mainly intent on sending her opponents to the bottom by direct onset. But all her efforts to sink the enemy by ramming proved unavailing. She was directed against ship after ship as soon as in each instance she could be swung round to the proper heading, but in each case the object of her attack was enabled by superior speed to dart away from her path unharmed. While this was going on every gun of the 197 that could be brought to bear upon her shield was in full play whenever the opportunity occurred. It hardly seemed possible that any structure of wood and iron wrought by the hands of man could withstand the successive volleys at close quarters, varying in distance from 3 to 30 yards, of the heaviest ordnance then ever known to be put afloat. Yet with a single exception her casemate resisted every missile. This exception was one out of four shots that struck from the 15-inch guns of the "Manhattan." The ball weighed 428 pounds, and was delivered at close quarters. Even this did not pass entirely through the casemate, but it penetrated the 6-inch armor and buried itself in the wooden backing.

Finding his guns so ineffective, the enemy now adopted the tactics of his assailant, and three successive attempts were made at running her down. The "Monongahela," one of the heaviest ships, rushed upon her with all the impetus she could derive from 30 pounds pressure of steam, and struck her fair, but with no other effect than carrying away her own prow and cutwater. Swinging round she delivered, in parting, the contents of her 11-inch guns without producing any apparent impression. The "Lackawanna," a vessel of the same class, made the next trial, striking the ironclad at full speed and at right angles, but the only fruits of the collision were the injury to herself of crushed bows and heavy leakage. The "Hartford" now tested her power in the same effort. Her blow was a glancing one,

and equally abortive. As she sheered off she poured her whole broadside against the casemate at the distance of 10 feet without sensible effect, and, in return, received a shell from the ironclad which exploded on her berth-deck, causing great havoc.

But though, with the exception noted, the shield up to this time had remained intact, the "Tennessee" had by no means escaped without injury. The concussions resulting from the incessant play of missiles upon her casemate, and the still heavier assaults by collision, had shaken her stout timbering and produced a serious leak, the after port cover had been disabled by a shot which killed one man and broke the leg of the admiral, the sliding covers of the two quarter ports had been so jammed by the fire of the enemy as to become fixtures, and the smoke-stack, long before riddled by shot, had been at last swept away flush with the deck, in consequence of which the steam was fast going down for want of draft.

The next disaster was utterly irremediable. The shot that caused it may be said to have decided the battle; it cut away the steering-chains. By some strange fatality these vital appliances had been left entirely exposed. They led along the entire length of the quarter-deck outside of the shield without cover or protection of any kind, though the severance of a single link was the loss of the ship. The relieving tackles, to which recourse was had, were equally bare of protection, and a succeeding shot unshipped them from the rudder-head.

This sounded the calamity, and made it the beginning of the end of the struggle. To reach those broken organs of a ship's guidance would have been to pass over a deck above which a swallow could not have flown without being brought down, so completely was it swept by the great guns and Minié rifles of the enemy. Hence no thought of repair was entertained.

With her steering apparatus demolished and her steam fast wasting away, the ironclad was incapable of executing the slightest manœuvre, incapable, in fact, of changing her position. The enemy was not slow to avail himself of the advantage. The monitors and the most powerful of the wooden vessels took position astern and on each quarter and poured their broadsides into her without longer intermission than was necessary to reload their guns. The "Tennessee" endured this concentrated fire of the heaviest guns nearly thirty minutes, and endured it in silence, for she was unable to bring a solitary gun to bear upon her assailants. At last Commander Johnson, the executive-officer upon whom the command had devolved, discovering that another attempt was about being made by one of the largest ships to sink the vessel by running her down, and satisfied that all further resistance was useless, with the concurrence of his wounded chief mounted to the top of the casemate, and, amidst the whizzing of countless balls that fortunately spared his person, hauled down with his own hands the Confederate flag.

The victory was dearly purchased by the Federals, as a comparison of the killed and wounded on both sides will show.

The casualties on the Confederate side were as follows: on board of the "Tennessee," 1 killed, 1 mortally wounded, 9 wounded; "Gaines," 2 killed and 3 wounded; "Selma," 8 killed and 7 wounded.

The loss of the enemy in killed and wounded was 300 men, exclusive of 100 carried down in the "Tecumseh." Adding the last figure, the entire number in killed and wounded amounts to within 78 of the aggregate complement of officers and crew of the whole Confederate squadron.

The commerce of the United States, which in 1861 whitened every sea, was the more exposed to attack by the withdrawal of her ships of war from foreign stations to co-operate in the investment of the Southern coast. The South improved the advantage by fitting out sea-cruisers, both at home and abroad, for the special purpose of preying upon it.

We have only space for a rapid and summary notice of the operations of the more noted of those vessels.

The "Sumter," a small propeller of 500 tons burden, was the pioneer. She was originally a Havana packet. Altered and strengthened, mounted with an 8-inch shell-gun on pivot amidships and two 24-pounder howitzers on either broadside, and manned by a crew of 105 men, all told, she turned out a swift, staunch, weatherly craft, in every respect adapted to her object. Commander Raphael Semmes was appointed to the command.

On the night of the 30th of June, 1861, this vessel put to sea from the mouth of the Mississippi, dashing through the blockading force, consisting of the "Brooklyn," "Iroquois," and "Minnesota." Outstripping the "Brooklyn," which gave chase, she found herself in a few hours free to start on her roving mission.

A week after her departure she entered Cienfuegos with a fleet of 7 prizes in her wake, having destroyed one during her passage.

Application was made to the local governor for the privilege of leaving the prizes in charge of an agent for future adjudication in the courts of the Confederacy. A similar request was subsequently made in the case of another prize at Puerto Caballo. In both instances it was refused. The European powers had, in fact, forbidden the introduction of prizes into their ports by either party, and the states on the American continent followed the example.

With the gates of the world thus churlishly closed against her captures, and her own harbors rendered inaccessible by the blockading forces, the "Sumter" was compelled to adopt the policy, which afterwards became general, of burning as fast as she captured, except where the prize was protected against destruction by a neutral cargo, in which case it was released under bonds made payable upon the declaration of peace between the United States and the Confederacy.

The "Sumter" reaped her first and most abundant harvest in the Caribbean Sea, where she remained cruising some weeks in the most frequented tracts of trade. She then coasted the shores of Venezuela and Guiana, and finally reached her most southern point at Maranham, Brazil. The necessity to renew her supplies obliged her to touch at the principal ports that lay in her way, and, as a general rule, she met with scant courtesy from the authorities. The world-wide influence of a powerful nation was

against her wherever she turned, and the hospitalities she required, when not positively refused, were bestowed in a carping and grudging spirit.

From Maranham she proceeded to a new cruising-ground, some 4 or 5 degrees north of the equator, in the path of vessels homeward bound from Cape St. Roque. Here several weeks passed without bringing a single capture, and with her coal nearly exhausted she bore up again for the West Indies.

Rumors were constantly reaching the little craft during her whole cruise of numberless vessels dispatched in hot pursuit of her. The realization of these tales seemed at length to have arrived. About the middle of November, while busy coaling at St. Pierre, Martinique, the "Iroquois" made her appearance. She stood slowly in and swept round her designed prey, narrowly inspecting her, the men of both vessels meanwhile being assembled at quarters. This was the nearest approach to actual hostilities. The superior force of the Federal vessel put entirely out of question any thought of a voluntary contest on the part of the "Sumter." Her enemy was double her size, carried nearly twice her number of men, and was armed with nine 11-inch guns. The "Iroquois" stood off and on the port several days, keeping up a close blockade, but the object of her watchfulness, patiently waiting her opportunity, at last slipped out, under the cover of night, unobserved, and in a few weeks put the Atlantic between herself and five steamers, said to be engaged in searching every nook and corner of the Antilles in quest of her, viz., the "Iroquois," "Keystone State," "Niagara," "Powhatan," and "Jacinto."

The active days of the "Sumter" terminated at Gibraltar, where she arrived in February, 1862. She was an old ship at the outset, had been battered by many storms during her service, and her timbers had been loosened and false keel knocked off by running on a sunken ridge in the shallow approaches to Maranham. A board of survey found her hull unserviceable and her boilers injured beyond repair, and she was laid up for evermore.

She had captured during her cruise, extending from the 30th of June to the 3d of the following January, 18 vessels, 2 of which were retaken, 7 which had been left at Cienfuegos released by the captain-general of Cuba, 4 released on ransom bonds, and 5 burned.

The Confederacy had five cruisers built in England for the special service of preying upon the commerce of the enemy. These were the "Alabama," "Georgia," "Florida," "Rappahannock," and "Shenandoah."

The "Georgia," under command of Capt. Maury, was employed some months in cruising, with more or less success, in 1861–62, but proving deficient in the self-sustaining qualities required by a man-of-war, she was sold out of service.

The "Rappahannock," built late in the war, crossed the Channel to Calais in order to complete her equipment, but the French laws of neutrality so hampered her efforts that it is believed she never put to sea again in the Confederate service.

The "Alabama" was distinguished by her activity and extraordinary success. Her depredations reached an extent that caused her name to be afterwards employed to designate all the losses sustained by the United States from the ships built in British waters, and it is perpetuated both in diplomatic and naval history. Her career is crowded with interesting and instructive incidents for which we can find no place in the few paragraphs we have to devote to her.

She was a small screw-propeller, registering a trifle over 1000 tons, and built at Birkenhead, on the Mersey, with comparatively light scantling, in view of speed rather than strength. She was 222 feet long, with 32 feet beam and 18 feet depth of hold, and drew on the average about 14 feet. She had two horizontal engines of 300 horse-power each, and a capacity for stowing 350 tons of coal, and berthing 120 men. She was bark-rigged, with a liberal breadth of canvas that rendered her largely independent of steam-power, and, taking her all in all, in speed, stability, and all the weatherly qualities essential to a national cruiser, few vessels ever surpassed her.

The "Alabama" came very near having her career nipped in the bud at the very outset. The secret of her destination had been well kept, but no vessel of her construction could fail to awaken strong suspicion in the minds of the British ministry. At last it was determined to seize her. The project took wind and reached the ears of those in charge, who had barely time to save her, by hurrying her equipment and sending her to sea. A few hours after her departure, on the 31st of July, 1862, the ministerial mandate for laying her under embargo reached the customs authorities at Liverpool.

She left ostensibly for a voyage to Nassau, under the charge of an experienced master, and manned by a crew of 70 men. Standing out of British waters, through the north channel of the Irish Sea, she doubled round the north of Ireland and was soon far beyond the reach of municipal processes, with her course shaped for Terceira, one of the Azores, where she dropped her anchor safely on the 10th of August in the roadstead of Porto Praya.

On the 18th she was joined by the English steamer "Agrippina," laden with coal and stores of all kinds, including munitions of war and six 32-pounders, which constituted a part of the battery that was to convert the "Number 290," as she was still called, into a Confederate cruiser.

Two days afterwards, while the transhipment of the "Agrippina's" cargo was in active progress, the steamer "Bahamas" arrived from Liverpool, bringing Capt. Semmes, of Sumter memory, who had been appointed to the command, accompanied by his officers and the rest of the battery, consisting of one 8-inch smooth-bore gun and one 7-inch rifled Blakely.

By the 24th the equipment was completed, and on that day the formalities of inaugurating "No. 290" into the service of the Confederacy took place in the offing, well outside of the marine league that marked the Portuguese jurisdiction. Capt. Semmes, after releasing the assembled crews of his own ship and the "Bahamas" from their articles of shipment, in a short address announced the character and purposes of his command and called for volunteers. Eighty men responded favorably. The English flag, which until now was still waving, was then dropped from the peak, and the ensign of the Confederacy given to the breeze amid the cheers of the new recruits and the firing of guns.

The cruise of the "Alabama," thus prosper-

ously begun off the Azores, carried her over almost every ocean highway pursued by the shipping of the United States. The highest northern latitude she reached was the parallel of 49°. She made her way thence to the West India seas and Gulf of Mexico. When her fortunes began to slacken in those fields she crossed the equator, coasted Brazil as far south nearly as Rio de Janeiro, then, turning eastward, doubled the Cape of Good Hope, and pushed her explorations to the farthest confines of the Indian Ocean.

It is no part of our purpose to follow her in these wanderings. During the nineteen months that her cruise lasted she was, everywhere and at all times, when in the tract of trade, incessantly engaged night and day in forays upon the shipping of the enemy, with a success that was never before equaled by that of any single national cruiser.

She captured in all 63 vessels of every size and description, the estimated value of which amounted in the aggregate to considerably upwards of $4,000,000. Of these prizes, 53 were destroyed, 9 released on ransom bonds, and 1 commissioned as a tender under the name of "Tuscaloosa," and armed with two small pieces of ordnance taken from one of the prizes.

The plans and movements of the "Alabama" were so skillfully conceived and conducted that, in spite of a number of heavy vessels dispatched in pursuit of her, she prosecuted her depredations unmolested in almost every quarter. She was never even sighted by the enemy but on two or three occasions. One of these occurred in November, 1862. While renewing her supply of coal at St. Pierre, Martinique, she was blockaded for a few days by the U. S. steamer "Jacinto," of 14 guns, 12 of which were 68-pounders, and two 11-inch guns. So heavy a force watching for her egress in the immediate offing seemed to threaten an end to her adventures, but she contrived to make good her escape under the cover of night, leaving her enemy ignorant of her departure until the morning revealed it.

During the early part of the following January, while in the Gulf of Mexico, she encountered the U. S. gunboat "Hatteras." The action, fought 38 miles off Galveston, lasted but 13 minutes, and resulted fatally to the Federal ship, which surrendered in a sinking condition, her own and the boats of the "Alabama" rescuing the crew but a few moments before she went to the bottom. The casualties were 2 killed and 5 wounded on board of the "Hatteras," and 2 wounded on board of the "Alabama."

In this contest the superiority in number of guns and weight of metal was with the Confederate vessel, which had also a somewhat larger crew than her opponent.

The "Hatteras" carried a battery of four 32-pounders (37 cwt.), two 30-pounders, rifled, and one 12-pounder howitzer. The armament of the "Alabama" was six 32-pounders (52 cwt.), one rifled 100-pounder, and one 8-inch smooth-bore shell-gun.

Her usual good fortune at last forsook her: she was sunk in her famous action with the "Kearsarge" off Cherbourg, in the British Channel, on the 18th of June, 1864. The engagement took place at an unpropitious moment for the Confederate vessel. She was not in the best fighting order. She had put into Cherbourg on the 4th of June for repairs, battered and worsted by a hundred storms experienced during 19 months of arduous service on every sea. Her boilers were in bad condition: they had to be patched up for the encounter; her engines required thorough overhauling; her copper is described as partially detached in many places to the serious impairment of her speed. She had no longer the alertness and swiftness of her earlier days.

Preparations for docking her had been already set on foot, which were postponed indefinitely by the appearance of the "Kearsarge." That vessel passed defiantly through the harbor without anchoring, and then took up a position in the offing in full sight of her adversary. This manœuvre was regarded as a challenge to battle, and the Confederate commander may well have felt that, after lording it so long over unarmed merchant ships, he could not afford to count closely the odds against him when the gauntlet was cast down by an enemy the world would regard as his equal.

The two ships were nearly of the same size and tonnage, but the Confederate was built, as stated, of slight scantling, while her opponent was stoutly timbered. In addition the latter, though inferior numerically in guns (by one only), carried heavier metal. Her two 11-inch guns gave her a marked preponderance. To crown all, her midship sections were clad with chain-cables enveloped in a wooden casing, while the sides of the "Alabama" were bare of all extraneous defenses.

The field of battle was well outside of the marine league. The contest was witnessed by throngs of spectators lining the French shore, some straggling French pilot-boats, and the "Deerhound," an English yacht.

We can give but a mere outline of the engagement. Besides the advantages mentioned, the "Kearsarge" had the speed of her opponent, and was thus enabled to choose her range. The general manœuvring of both vessels was somewhat unusual. Each tried to get in position for delivering raking fires. This resulted, during nearly the whole combat, in continuous revolutions of the two antagonists round each other in advancing circles and at varying distances, with their heads in opposite directions and their starboard broadsides kept constantly *vis-à-vis.*

The cannonading was furious and incessant on both sides from the beginning to the end, yet withal marked with much coolness and deliberation. The battle lasted about an hour and a quarter. By this time the condition of the "Alabama" was hopeless. Her sides were gaping in wide rents, her fires were out, her steam down, many of her men were killed and wounded, and with her hold filled with water from a gaining leak, she was visibly sinking. Add to all this, the "Kearsarge" was now getting into position for pouring in raking fires, from which there was no escape, and which she was powerless to return.

In this desperate extremity nothing was left but to haul down the Confederate flag. Scarcely had it disappeared before the "Alabama" went to the bottom, stern foremost, leaving all the officers and crew, except the wounded, who had been passed into a boat before the final catastrophe, struggling for life in the sea. The English

yacht, referred to above, hastened to the rescue, and saved many lives, including that of the commander. The boats of the "Kearsarge" also put forth their best efforts in this office of humanity.

The officers of the "Alabama" felt, on touching the deck of the yacht, that it was at least some alleviation to their defeat that the waves had cast them upon British territory. They had never been in the custody of their conquerors, and, not regarding themselves as prisoners even in a strained and technical sense, they felt free to avail themselves of the refuge they had reached and were landed in England.

The armament of the "Alabama" in this conflict consisted of one 7-inch rifled Blakely, one 8-inch smooth-bore pivot-gun, and six 32-pounder smooth-bore broadside guns. Her crew amounted to 120 men.

The "Kearsarge" carried a battery of two 11-inch Dahlgrens, four 32-pounders, and one light rifled 28-pounder. Her crew, in officers and men, is stated to have been 162.

The loss of the Confederates in killed and wounded was 28, of whom 7 were killed; the loss by drowning was 19. The "Kearsarge" is alleged to have come out of the fight without serious damage or the loss of a single life.

The "Florida," originally the "Oreta," under the command of Lieut. Commanding Maffitt, took an active part in the devastation of the commerce of the enemy. She was a small bark-rigged propeller of 560 tons, mounted with engines of 240 horse-power. She sailed from Liverpool, where she was built, on the 18th February, 1862, in ballast, bound to Nassau, where she arrived about the 20th of April. She was here seized by H. M. ship "Greyhound" upon the charge of violating the British Foreign Enlistment Act, but released by the Admiralty Court after a short detention. The 7th of August found her at a small rocky islet called Green Cay, some 60 miles to the southward and eastward of Nassau, busy receiving her stores and ammunition and mounting her battery, which had all been brought from Nassau under preconcerted arrangements. Her armament consisted of two Blakely 7-inch pivot-guns, and six short Low More 7-inch broadside guns.

Sailing from Green Cay on the 20th, the yellow fever in its most malignant form broke out on board on the following day, and forced her to make harbor at Cardenas, Cuba, where the epidemic swept off two-thirds of her crew. It became necessary in this crippled condition to seek a Confederate port, and on the 4th of September the "Florida" ran into Mobile Bay through the blockading force, receiving some damage from their fire. Refitted and provided with a full crew, she put to sea again early in January, 1863, in a northeast gale, again dashed through the blockading force, now much strengthened, and entered upon destructive voyages which lasted many months, and extended from the latitude of New York to the equator.

Ultimately the cruise of the "Florida," now commanded by Lieut. Commanding Morris, was brought to a disastrous and sudden termination on the 7th of October, 1864, in the harbor of Bahia, Brazil. She had been preceded in her arrival at this port by the U. S. steamer "Wachusett." Capt. Morris, confiding in the neutrality of a friendly harbor, whose hospitalities both vessels were enjoying, took up his quarters on shore himself and allowed half of his crew to go on liberty. While his vessel lay in this defenseless condition she was overpowered, after a brief resistance, in a night attack made by the "Wachusett," captured, and towed to sea. This violation of both international and municipal laws caused Brazil to make prompt reclamations against the United States, in which she insisted upon the restoration of the vessel in *statu quo* to the waters from which she had been taken. During the pendency of this demand the "Florida" was run down and sunk, accidentally it is alleged, while in tow of a vessel belonging to the U. S. squadron in the lower waters of the Chesapeake.

The "Shenandoah" ("Sea King"), commanded by Capt. Waddell, was commissioned in October, 1864. She was a Clyde-built auxiliary screw-ship with an iron frame and teak planking, measuring 900 tons, and carrying a battery of two 32-pounders, rifled, four shell-guns (57 cwt.), and two 22-pounders. She entered upon her cruise with but 13 men, besides the regular staff of officers, trusting to recruiting a full complement by volunteers from captures, and from this source eventually swelled her force to 100.

Her cruise extended into every navigable sea, except the Antarctic, and carried her through Behring Strait into the Arctic Ocean, where she reached to within 20 miles of the 67th parallel of latitude, where her progress was blocked by ice. Her entire cruise occupied 13 months, during eight of which she was actively employed. She added to the list of captures 38 valuable prizes, 6 of which were released on bonds and the remainder destroyed.

Intelligence of the fall of the Confederacy reached the commander of the "Shenandoah" while cruising off San Francisco, on the 2d of August, 1865. He thereupon proceeded to carry his denationalized command, by the way of Cape Horn, to Liverpool, which place he reached in November, and surrendered her to her majesty's government, which transferred her to the possession of the United States.

Eventually, the Confederate navy, at least that portion of it in her own waters, passed out of existence piecemeal. It was a natural pride that prompted the determination in the last strait to destroy the ships rather than leave them as trophies to swell the triumph of the victors. As city after city fell along the coast, the final act before evacuating each was to set fire to the public vessels, and when, after the abandonment of Richmond, the Federals took possession, they found the James strewed with the fragments of the "New Virginia," the "Richmond," and the "Fredericksburg," all ironclads, and about six wooden gunboats, the last remnant of the Southern navy, save one only cruiser on the high seas, the "Shenandoah," which at the moment was unconsciously floating at her gaff the flag of a nation well-nigh passing away.—*C. H. McBlair, late Captain C.S.N.*

Navy Department. By an act of Congress, approved April 30, 1798, there was established "an executive department to be denominated the Department of the Navy," and the chief officer of it was therein directed to be called the "Secretary of the Navy."

During the Revolutionary war Congress had the superintendence of the navy, and appointed, in October, 1775, Messrs. Deane, Langdon, and Gadsden, members of Congress, the "Marine Committee." On December 13 of that year Congress enlarged and re-constituted the committee, by ballot, from its own members, as follows: Messrs. Bartlett, Hancock, Hopkins, Deane, Lewis, Crane, Robert Morris, Read, Chase, R. H. Lee, Hewes, Gadsden, and Houston. While this committee examined and reported on all naval matters, Congress appointed all commissioned officers, but gave the committee power to appoint all officers of subordinate rank, and authorized it to give instructions for the employment of ships.

By a resolution of Congress, approved November 6, 1776, it was ordered that three persons well skilled in maritime affairs should be immediately appointed to execute the business of the navy under the direction of the "Marine Committee," and John Nixon, John Wharton, and F. Hopkinson were appointed. These experts, or advisory persons, were called "The Continental Navy Board," or "Board of Assistants to the Marine Committee," and sometimes the "Board of the Middle District." There was also an "Eastern Board," consisting of three persons, who executed the instructions of the committee, in their district.

The act of October 28, 1779, established a "Board of Admiralty," to consist of three persons not members of Congress, and two members of Congress; and on the 11th of January, 1781, Congress, by resolution, invested James Reed with full power to conduct the business of the Navy Board in the middle department, and on February 27 of that year Major-General Alexander McDougall was appointed "Secretary of Marine" under the act of February 7, 1781. This management continued but a short time, for, August 29 of that year, Congress resolved that the functions and appointments of the Board of Admiralty, the several navy boards, and all civil officers appointed under them should cease, and an "Agent of Marine" should be appointed, and on September 6 following Robert Morris, Superintendent of Finance, was assigned those duties. He continued the superintendence and management of the navy for nearly eight years. The act of August 7, 1789, charged the Secretary of War with the performance and execution of such duties relative to the naval forces, or to such other matters respecting naval affairs, as the President of the United States assigned him.

It was not until nine years had elapsed that these duties of the Secretary of War ceased, when the act of April 30, 1798, established the "Department of the Navy," or, as it is now called, the "Navy Department," and created the office of "Secretary of the Navy."

The Secretary of the Navy is appointed by the President, by and with the advice and consent of the Senate, and is a member of his Cabinet. George Cabot, of Massachusetts, was appointed the first Secretary of the Navy, but he declined, and Benjamin Stoddert, of Maryland (a resident of Georgetown, D. C., at the time of his appointment), was appointed. The Secretaries of the Navy, in the order of appointment, are as follows:

Name.	State.	Date of Appointment.	By whom Appointed.
George Cabot*	Mass.	May 3, 1798	John Adams.
Benj. Stoddert	Md.	May 21, 1798	
Robert Smith	Md.	Jan. 26, 1802	Thomas Jefferson.
Paul Hamilton	S. C.	Jan. 7, 1809	James Madison.
William Jones	Pa.	Jan. 12, 1813	
R.W. Crowninshield	Mass.	Dec. 19, 1814	
Smith Thompson	N. Y.	Nov. 30, 1818	James Monroe.
Samuel L. Southard	N. J.	Dec. 9, 1823	
John Branch	N. C.	March 7, 1829	Andrew Jackson.
Levi Woodbury	N. H.	May 23, 1831	
Mahlon Dickerson	N. J.	June 30, 1834	
James K. Paulding	N. Y.	July 1, 1838	Martin Van Buren.
George E. Badger	N. C.	March 5, 1841	Wm. H. Harrison.
Abel P. Upshur	Va.	Sept. 13, 1841	John Tyler.
David Henshaw†	Mass.	July 24, 1843	
Thos. W. Gilmer‡	Va.	Feb. 15, 1844	
Lewis Warrington	U.S.N.	*ad interim*	
John Y. Mason	Va.	March 14, 1844	
George Bancroft	Mass.	March 11, 1845	James K. Polk.
John Y. Mason	Va.	Sept. 10, 1846	
Wm. B. Preston	Va.	March 8, 1849	Zachary Taylor.
Wm. A. Graham	N. C.	Aug. 1, 1850	Millard Fillmore.
John P. Kennedy	Md.	July 26, 1852	
James C. Dobbin	N. C.	March 8, 1853	Franklin Pierce.
Isaac Toucey	Conn.	March 7, 1857	James Buchanan.
Gideon Welles	Conn.	March 7, 1861	A. Lincoln. Andrew Johnson.
Adolph E. Borie	Pa.	March 9, 1869	Ulysses S. Grant.
Geo. M. Robeson	N. J.	June 26, 1869	Ulysses S. Grant.
Rich. W. Thompson	Ind.	March 13, 1877	R. B. Hayes.

By the act approved February 7, 1815, a *Board of Commissioners for the Navy of the United States* was constituted, but the act provided that nothing in it should be construed to take from the Secretary of the Navy his control and direction of the naval forces of the United States as now by law possessed. This act was repealed August 31, 1842, and the following-named bureaus were established: 1. Navy-Yards and Docks. 2. Construction, Equipment, and Repairs. 3. Provisions and Clothing. 4. Ordnance and Hydrography. 5. Medicine and Surgery. This organization was continued until, by the act of July 5, 1862, the number of bureaus was increased and their titles established, as follows: 1. Yards and Docks. 2. Equipment and Recruiting. 3. Navigation. 4. Ordnance. 5. Construction and Repair. 6. Steam Engineering. 7. Provisions and Clothing. 8. Medicine and Surgery.

The duties of these bureaus are indicated by their titles; their chiefs are officers of the navy appointed by the President, by and with the advice and consent of the Senate. In addition to the duties of the chief of Bureau of Navigation, he is head of the "Office of Detail," and has, under and by direction of the Secretary of the Navy, the detailing and ordering of officers for duty at navy-yards and stations, on vessels, etc.

The chief clerk of the Navy Department has the care and custody of the files and records of the Department, the general supervision of its correspondence, and such other duties as the Secretary assigns him.

The office of "Assistant Secretary of the Navy" was created by the act of July 31, 1861, and abolished by the act of March 3, 1869. The following-named gentlemen held that office: Gustavus V. Fox, of Massachusetts, from August 1, 1861, until May 31, 1866; William Faxon, of Connecticut, from June 1, 1866, until March 3, 1869.

The office of "Solicitor and Judge-Advocate"

* Declined.
† Not confirmed by Senate.
‡ Killed on board "Princeton," February 28, 1844.

was created by the act of March 2, 1865, and finally abolished by the act of June 19, 1878. The following-named gentlemen held that office: William E. Chandler, of New Hampshire, appointed March 9, 1865; and John A. Bolles, of Massachusetts, appointed June 10, 1865, and died June, 1878.—*Jesse E. Dow.*

Navy-yard, Boston, Mass. The navy-yard at Boston, Mass., is situated at the confluence of the Charles and Mystic Rivers, on land formerly known as Moulton's Point. Jurisdiction was ceded by the State of Massachusetts to the United States in 1800 over an area of 65 acres, and there was purchased for the government in that year, by Dr. Aaron Putnam, 35 acres for $37,356. This area has been increased by subsequent purchases of 5186 square feet from Capt. Isaac Hull, August 15, 1817, for $3889.50, and 115,210½ square feet from Oakman and Eldridge, June 1, 1863, for $123,100. This, with the filling in of the flats and marsh, makes an area of 87¼ acres in 1880. It is surrounded on the land side with a substantial granite wall 12 feet high, that was built in 1825–26, with a water frontage of 8270 feet, which includes 5214 feet of wharfage; it has 3 building-slips, 4 ship-houses—making 7 building-ways. There is a timber-dock at the eastern end of the yard that has an area of 5 acres 36 rods. In the upper part of the yard there are 2 wet-basins, which are only separated by a roadway; one of them contains an area of 2½ acres, the other 4½ acres, capable of being adapted for an extensive system of dockage. There are now (1880) inside of the walls 20 brick, 11 stone, 36 wooden, and 2 iron buildings, with 4 regular timber-sheds, besides numerous outhouses and temporary buildings. Only 8 buildings are standing that were on the yard plan for 1823. The oldest is No. 5, built in 1803 of brick for a store-house, offices, sail-loft, etc., now occupied in part by the naval library and institute, museum, court-martial room, dispensary, offices, etc., and the dwelling-house for the commandant, which was finished in 1809. There are two fine avenues running lengthwise of the yard, ornamented with shade-trees. The commandant's office is in a small one-story wooden building located near the centre of the yard on the main avenue.

There have been 22 regular commandants, viz.: Samuel Nicholson was the first (1800). He died in command December 29, 1811. William Bainbridge (who was in command three separate terms), Isaac Hull, William Crane, Charles Morris, Jesse D. Elliott, John Downes (twice), John B. Nicholson, Foxhall A. Parker, Francis H. Gregory, Silas H. Stringham (twice), William L. Hudson, John B. Montgomery, John Rodgers, Charles Steedman, Enoch G. Parrott, Edward T. Nichols, Foxhall A. Parker (2d), William F. Spicer (who died in command Nov. 29, 1878), and the present commandant, George M. Ransom. There were two of the executive-officers in command for over three months, and one for over two months, during the interval of appointment or continued absence of the regular commandants, viz.: William B. Shubrick, Josiah Tattnall, and Milton Haxtun.

In 1802, by order of the Secretary of the Navy, 5 acres of land in the northeast corner of the yard was assigned to the Treasury Department for a marine hospital, on which a hospital with all of the necessary outbuildings was erected, and inclosed with a picket-fence from the navy-yard. April 30, 1825, this property was transferred to the Navy Department upon payment to the Treasury Department of $12,875, the estimated value of the buildings thereon, and a marine hospital was erected in Chelsea. The work of tearing down the old hospital began August 15, 1825, and on its site was erected a block of 4 brick dwelling-houses, facing the yard, with the stone wall running along the Salem turnpike in their rear. This was changed in 1836–37 by facing the buildings outwardly to the turnpike, and erecting the wall around them in their rear and an iron picket-fence in front. They were first occupied in August, 1826, by Master-Commandant Kearney, Surgeon John A. Kearney, Sailing-Master Knox, and Naval Storekeeper George Bates. They are now allotted to the captain of the yard, ordnance-officer, naval constructor, and surgeon of the yard.

The 5 brick dwelling-houses near the main gate, western entrance, were erected in 1833 for the warrant-officers. They were first occupied by Boatswain W. Hart, Gunner W. B. Brown, Carpenter Calvin Oaks, Sailmaker S. B. Banister, and Sailing-Master C. W. Waldo, check-officer. They are now occupied by the paymaster of the yard, equipment-officer, civil engineer, steam engineer, and pay director in charge of provisions and clothing.

The mail messenger lives in the brick house next the main gate, and the apothecary has rooms assigned him in building No. 5. These are all who live within the walls except the marines.

The marine barracks is a three-story brick building, in line with the wall on Chelsea Street, between the commandant's house and the rope-walk. It occupies an area, including the parade-ground, of 1¼ acres and can accommodate 250 marines, with the necessary complement of offices.

The rope-walk is the finest in the country; it was built, in 1836, of rough ashlar granite; it runs parallel with the wall on Chelsea Street, and is 1360 feet long, with a laying-ground 1253 feet by 45. The second story is 748 feet long; it was built in 1856; and the head-house is three stories, 60 by 70 feet, slated roofs; it has 2 double engines, one of 200 horse-power, the other 150 horse-power, capable of manufacturing 2500 tons per year of all kind and sizes of rope. There is a fire-proof store-house for the hemp and a tar-house, both built of granite.

The two-story brick building to the eastward, in line with the wall, was arranged for the manufacture of wire rigging, etc., in 1873; it is 186 by 38 feet; it has an engine of 80 horse-power, and can produce 500 tons per year of all kind of wire-rigging, besides green hide rope in sufficient quantities to supply the wants of the service.

In the boiler-house, which is built of brick, 55 by 44 feet, one story, are 8 boilers, each independent of the others; these supply the steam for the engines in the rope-walk and wire-shop.

The steam-engineering building, erected in 1856, is built of brick, with granite trimmings. It is in form a parallelogram, and covers an area of 135,755 square feet. It contains a brass- and iron-foundry, boiler-, blacksmith-, and machine-shops; these are filled with all the necessary

tools, appliances, and machinery required for an extensive business; there are 2 engines of 100 horse-power each in the building. The boiler-house and chimney are in the centre; there are 8 boilers that work in pairs, and 5 donkey-pumps. The chimney is 239½ feet high; it was finished October 7, 1858.

The rolling-mill is built of brick, 207 by 86 feet, and has an engine of 100 horse-power to work the necessary machinery.

One iron building is occupied by the Thilmany process for wood preserving; it can turn out 1000 cubic feet per day.

The dry-dock was begun July 10, 1827, under the superintendence of Laomi Baldwin, and finished in June, 1833. It is built of hammered granite in a substantial manner, with a great arch 60 feet in width. It was originally 305 feet long by 86 feet wide, and cost $679,000; in 1857–58, however, it was extended 65 feet in length at an expense of $314,825, making its total length 370 feet, and its entire cost $993,915. It has a capacity, with average high-tide, of 5,764,500 gallons. The head-house was built, in 1832, of granite, and is occupied, in part, by the engine which pumps out the dock. This engine was manufactured at Hartford, Conn., in 1855; it has a cylinder 20 inches in diameter, with 84-inch length of stroke, makes 25 revolutions per minute, capable of throwing 800 gallons per revolution from the 2 pumps connected with it. The average time it takes to pump out the dock with 25 feet of water is about 4 hours. There is, also, a donkey-pump connected with the above, with a pumping capacity of 160 gallons per minute. The first vessel put into this dock was the "Constitution" ("Old Ironsides"), June 24, 1833, and its present occupant is the "Hartford,"—the two most famous vessels in the navy.

Construction occupies several buildings. The mast-shop, the most easterly building in the yard, is of wood, slated; the molding-loft, boat- and carpenter-shops are of granite; the joiner-shop, of the same, with an engine of 100 horse-power. The saw-mill is of wood, and has an engine of 100 horse-power. Two masting-shears, one of 130 feet in height, will hoist 80 tons; the small shears at the lower part of the yard is 105 feet high, and will hoist 60 tons.

The store-houses of equipment, steam-engineering, provisions and clothing, and yards and docks are all built of granite in a substantial manner. The ordnance building is of brick, with granite trimmings, 274 by 90 feet; it has an engine of 100 horse-power. The coal- and boiler-house, 50 by 64 feet, contains 4 boilers. There are 2 brick shell-houses. The magazine is on the hospital grounds in Chelsea, and the nitre depot in Malden, Mass. There is a gun-park, 363 by 124 feet; it has 6 skids, built of granite, with iron rails running lengthwise; a shot-park, 317 by 125 feet. There is a saluting battery of 30 guns on the quay-wall, with a small magazine to hold saluting powder. A railroad track was laid in 1863 the length of the yard; it is connected with the Fitchburg road. For putting out fires there are 2 steam fire-engines, 9 hose-carriages, 1 hook-and-ladder truck, and 24 chemical extinguishers in the yard.

Thirty-nine ships-of-war have been launched at this yard. The "Frolic," in 1813, was the first one; "Independence," June 22, 1814; "Alligator," November 4, 1820; "Boston," October 15, 1825; "Warren," November 29, 1826; "Falmouth," November 3, 1827; "Boxer," November 22, 1831; "Porpoise," May 31, "Pioneer," October 25, "Consort," October 29, 1836; "Cyane," December 2, 1837; "Marion," April 24, 1839; "Bainbridge," April 26, 1842; "Erie," 1842 (a sloop-of-war same name was launched in 1813, rebuilt in 1820 at a cost of $56,174, and broken up at Boston in 1841 and this store-ship constructed); "Cumberland," May 24, 1842 (keel laid in 1825); "Plymouth," October 11, 1843; "Vermont," September 14, 1848 (keel laid in 1818); "Princeton," October 29, 1851; "Merrimac," June 14, 1855; "Hartford," November 22, 1858; "Narragansett," February 15, 1859; "Wachusett," October 10, "Housatonic," November 20, "Maritanza," November 26, 1861; "Canandaigua," March 28, "Genesee," April 2, "Tioga," April 18, 1862; "Tallapoosa," February 17, "Pequot," June 4, "Winooski," July 30, "Saco," August 28, 1863; "Monadnock," a double-turreted ironclad, March 23, "Ammonoosuc," July 21, 1864,—name changed in 1869 to "Iowa"; "Guerriere," September 9, 1865; "Manitou," August 25, 1866,—name changed in 1869 to "Worcester"; "Nantasket," August 15, 1867; "Alaska," October 31, 1868; "Intrepid," iron torpedo-boat, March 5, 1874; "Vandalia," October 23, 1874, was the last one launched. Several vessels were built for the treasury, light-house, and survey, such as the brig "Apprentice," "John Hancock," "Bibb," "Cohassett," "Blue Light," etc.

There are now on the stocks at this yard the "Virginia" (keel laid in 1818); "Connecticut" (keel laid January 2, 1864); "Oregon," monitor, double-turreted ironclad (keel laid April 15, 1864); and the "Pennsylvania" (keel laid in 1865).

The "Niagara," "Iowa," "Ossipee," and "Ohio" are in ordinary. The "Hartford" is under repairs, and the "Cohassett" is employed as the yard tug-boat. The U. S. receiving-ship "Wabash" lies off the yard.—*A. H. Massie.*

Navy-yard, Brooklyn. The Brooklyn Navy-Yard, known officially as the New York Navy-Yard, is situated on Wallabout Bay, East River. This bay is about half a mile wide and nearly semicircular in shape, the greater portion of it being occupied by an island, 31 acres in extent, known as the Cob Dock; the channel between the Cob Dock and the yard proper is 400 feet wide, and upon it is most of the water front of the yard, which includes more than a mile of the most eligible wharfage in the harbor of New York. The total area of the yard, including the Cob Dock and the Naval Hospital grounds, is 199.77 acres, of which but about 45 acres are comprised in the yard proper, and occupied by buildings, wharves, docks, etc.

During the Revolutionary war the "Old Jersey" and other prison-ships were moored in the Wallabout, and the shores of the bay were used as a burying-place for the thousands of Americans who died on board them. Toward the close of the last century John Jackson established a ship-yard on the west side of Wallabout Bay, and in 1799 he built for the United States a small frigate, called the "Adams," which was the first man-of-war launched at the site of the present yard. In 1801 Jackson disposed of his

property, about 30 acres, to the government for $40,000; in 1824 the piece of land now occupied by the U. S. Naval Hospital, some 35 acres, was purchased for $7650, and in 1848 the intervening portion was obtained for $285,000; finally, in 1867, an irregular piece of land on the northwest corner was bought for $90,000. Excepting the hill on which the commandant's house stands, and that where the hospital is built, this property was originally little more than a mud flat.

Immediately after the purchase in 1801, Lieut. Jonathan Thorne was ordered in charge, and remained until 1806, nothing being done meanwhile to improve the property. He has been succeeded by the following commandants, who took charge at the dates mentioned:

Captain Isaac Chauncey, 1806.
Captain Samuel Evans, 1812.
Captain Isaac Chauncey again in 1824.
Captain Charles G. Ridgely, July, 1833.
Captain James Renshaw, November, 1839.
Captain M. C. Perry, June, 1841.
Captain Silas H. Stringham, July, 1843.
Captain Isaac McKeever, September, 1846.
Captain Wm. B. Salter, October, 1849.
Captain Charles Boorman, October, 1852.
Captain Abram Bigelow, October, 1855.
Captain Lawrence Kearney, February, 1857.
Captain S. L. Breese, November, 1858.
Rear-Admiral Hiram Paulding, October, 1861.
Rear-Admiral Charles H. Bell, May, 1865.
Rear-Admiral S. W. Godon, July, 1868.
Rear-Admiral Melancthon Smith, October, 1870.
Vice-Admiral S. C. Rowan, June, 1872.
Commodore J. W. A. Nicholson, September, 1876.
Commodore George H. Cooper, May, 1880.

In 1806–7 the present commandant's house was built, 6 brick buildings for store-houses and offices were commenced, and by the sale of chips money was obtained to build the stone embankments to the terraces on the hill. During the war of 1812 over 100 vessels were fitted for sea, supplied with stores, etc. In 1829 the "Fulton," the first steam war-vessel, which had been built in 1815, was accidentally destroyed by the explosion of her magazine while she was at anchor off the yard. Among other vessels launched were the "Ohio," in 1820; the "Savannah," begun in 1822, but not launched until 1842; the notorious brig "Somers," in 1842; and the ill-fated "Albany," in 1846. The stone dry-dock, begun in 1841, was not finished until 1851. It is built of granite, and cost $2,113,173; its main chamber is 285 by 35 feet at the bottom and 307 by 98 feet at the top, and its depth is 36 feet; it can be emptied by steam-pumps in 2½ hours. During the civil war 14 vessels were built and over 400 fitted out; the number of men employed increased from 1650 in 1861 to over 6000 in 1863; and in 1865 an average of 5000 was employed, and the pay-roll was $3,952,000, work never ceasing day or night; at present there are about 600 workmen.

Since the war but two new vessels have been built, the "Trenton" and the torpedo ram "Alarm," but many improvements have been made, and some fine buildings added; the streets have been graded, paved, and sewered, and hundreds of trees planted; the Cob Dock has been made attractive with trees, grass, and flowers, and Sailors' Hall built for the accommodation of the recruits on the receiving-ships. It has bath-rooms and a barber-shop on the lower floor, and a library, reading-room, and stage for amateur performances on the upper.

The Naval Lyceum, founded by officers in 1833, is one of the attractions of the yard. It has a library of 5000 volumes, a large collection of curiosities, and valuable cabinets of coins, minerals, etc. On the eastern side of the yard is the naval hospital, a fine building, with a capacity for 500 patients. In the same grounds are the naval laboratory and the naval cemetery. The marine barracks, with their parade-ground, cover 6½ acres, and have accommodations for 750 men. The old line-of-battle ship "Vermont" and the steam-frigate "Colorado" are used as receiving-ships, and are moored to the Cob Dock; they can berth 2000 men. The whole number of buildings in the yard, including 2 ship-houses and 10 houses for officers, is over 80. The yard fire department includes 2 steam fire-engines and a complete system of fire-alarm telegraph. For a fuller account of the New York Navy-Yard, see "Lecture by Commodore J. W. A. Nicholson before the Long Island Historical Society," from which much of this article is compiled.—*F. Hanford, Lieutenant U.S.N.*

Navy-yard, League Island, Pa., is situated on League Island, in the Delaware River, the western extremity of the island being nearly opposite the mouth of the Schuylkill River, and it extends easterly about 2¼ miles; the extension of Broad Street, of the city of Philadelphia, would pass nearly across the centre of the island, and the main entrance of the yard is at the foot of that street. The entire island, which is now the property of the government, consists of,—area within dikes, 410 acres; area between the banks of the back channel, 305.5 acres; area between the back channel and Government Avenue (the northern boundary-line of the property), 37.25 acres; area outside of dikes to wharf-line, 170.25 acres; making in the aggregate an area of 923 acres. The dikes are absolutely necessary, as the natural surface of the island is about 3½ feet below high-water mark; the land is also ditched, and the ditches connect with tide-gates, so that any water accumulating from rains or other sources passes out at low-tide. Owing to the recent establishment of this yard very few buildings have been erected as yet. At the main entrance on the right is a porter's lodge, and on the left a guard-house; the other buildings on the right of the main avenue are a very neat and attractive residence lately occupied by the civil engineer of the yard, the surgeon's office, commandant's office, naval constructor's offices and shops. The ship-house, which was blown down by a severe storm about two years ago, has not yet (1880) been rebuilt. The machine-shops, gun-park, and stables are on the left side of the main avenue. The quarters of the marine guard of the yard are located in the hull of the frigate "Antietam." The location of this yard is admirably adapted for ship-building and repairing, as it has sufficient depth of water on the river front to float the largest vessels in the navy, and it should certainly have a sufficient amount of money appropriated by Congress to make it one of the finest navy-yards in the world.

Navy-yard, Mare Island, Cal. This navy-

yard is situated on Mare Island, which forms a portion of the eastern side of San Pablo Bay, its southernly end making the intersection of the Strait of Carquinez and Mare Island Strait. The former is the outlet of the two largest rivers of California, the Sacramento and San Joaquin, and the latter constitutes the improved front of the navy-yard, as well as that of the city of Vallejo, on the opposite shore, and also the outlet of the Napa Creek, which drains the fertile valley above. The distance from San Francisco is 26 miles. The island is about 2½ miles long, with an area of about 1000 acres of upland, to which may be added some 2000 acres of tule land adjoining it on the north, also belonging to the United States. The highest point of the island has an altitude of 280 feet. The soil has a rocky foundation, very suitable to sustain the weight of the heavy structures required in a naval dock-yard.

The position is well adapted for a naval station. The harbor is completely land-locked, easy of access, with excellent anchorage, deep water, large capacity, and is free from the teredo and other destructive marine worms. It is well located for protection in war, being within the defenses of the harbor of San Francisco. It is convenient of access by land, as the railroad systems of the Pacific coast form a focus on the shore of the Strait of Carquinez, 1 mile distant from the island.

The principal structures are:

The sectional dock, which has been used for raising the largest vessels during the past 25 years.

The stone dry-dock, now in course of construction, of capacity sufficient for docking the largest ships.

The foundry and machine-shop.

The construction workshops.

The smithery.

The blacksmith's shops.

The sail-loft.

The rigging-loft.

The yards and docks workshops.

The iron-plating shop.

The saw-mill and the timber-shed, all of large capacity and well adapted to the purposes for which they were designed.

The office building, in which the commandant's and other offices are located, occupies a prominent position.

The officers' quarters, including the residence of the commandant, are built on a beautiful avenue some distance from the water front.

The navigation store-house, and the ordnance store-houses and magazines, are well located, and kept in a high state of efficiency.

The marine barracks and U. S. naval hospital are eligibly located on the island.

The report of the Secretary of the Navy, 1878, shows the approximate value of property belonging to the navy at this yard to be $7,181,-720.78, and his report for 1879 remarks: "The great importance of this yard commends it to the special consideration of Congress. It being the only one on our Pacific coast, it is the exclusive representative of the Department in repairing vessels attached to the Pacific and Asiatic Squadrons."

The navy-yard was established on this island in the year 1854, Admiral (then Commander) D. G. Farragut having assumed command in September of that year.

The following is a list of commandants and date of assuming command:

Commander D. G. Farragut, September 16, 1854.
Captain R. B. Cunningham, July 16, 1858.
Captain David McDougal, March 13, 1861.
Captain W. H. Gardner, June 5, 1861.
Captain Thomas O. Selfridge, May 27, 1862.
Captain D. McDougal, October 17, 1864.
Commodore T. T. Craven, September 5, 1866.
Commodore James Alden, August 1, 1868.
Captain Reed Werden, March 17, 1869.
Rear-Admiral T. T. Craven, April 15, 1869.
Commodore J. R. Goldsborough, January 1, 1870.
Commodore E. G. Parrott, April 15, 1871.
Rear-Admiral T. O. Selfridge, September 3, 1872.
Rear-Admiral John Rodgers, July 3, 1873.
Commodore E. R. Colhoun, April 17, 1877.

The following vessels were reported at this navy-yard in July, 1880, viz.: "Mohican," rebuilding; "Monadnock," rebuilding; "Benicia," in ordinary; "Independence," receiving-ship; "Cyane," in ordinary; "Iroquois," under repairs; "Saco," in ordinary; "Narragansett," in ordinary; "Camanche," in ordinary; "Nyack," in ordinary; "Monterey," tug in yard service; "Mohican" (old), in ordinary; "Monadnock" (old), in ordinary; "Monongahela," in ordinary; "Ranger," under repairs; "Tuscarora," under repairs; and the flag-ship "Pensacola."—*E. R. Colhoun, Commodore U.S.N.*

Navy-yard (Gosport), Norfolk, Va. No navy-yard belonging to the United States, from its geographical position, is more important than that at Gosport, Va. Located near enough to the entrance of the Chesapeake Bay to be easily accessible, it is, at the same time, in a position readily defended from attacks either by land or by water, and, as has been repeatedly shown, can be held by a small force against a very largely superior one. There is in the vicinity an abundant supply of timber and other material, while the close proximity of a populous city secures to it the command of all the skilled labor that can be required. Such is the mildness of the climate, that work of all sorts can be carried on at all seasons of the year without interruption. Hampton Roads, the outer harbor, is an excellent point of rendezvous for a fleet or squadron.

A glance at the map will demonstrate the very great importance of a naval station in this vicinity. The Chesapeake, with its navigable tributaries, penetrates into the heart of several of the richest States in the Union, reaching to the national capital. A foothold in its waters would, therefore, be of the utmost strategic importance to an invading enemy, and would probably be one of the earliest objects sought by them, as past history has fully shown. The width of the entrance of the bay is so great that it would be impossible to defend it except by a naval force, which should have a repairing, coaling, and victualing station as near at hand as possible, consistent with entire defensibility for itself, with a reasonably secure outer harbor, large enough for the necessary manœuvres of a squadron in getting under way and forming. All of these conditions are admirably filled by the location of the Gosport Yard.

Just before the breaking out of the war of the Revolution, the British established a marine-

yard, for the use of their navy, on the site of the present navy-yard at Gosport (as that portion of Portsmouth has always been called), having, as is stated in a letter now on file in the Navy Department, written in 1824, by Miles King, United States navy-agent, selected this point, after a careful survey of all the ports within its dominions in North America, as the most eligible situation for a naval station. The name of Gosport was doubtless taken from Gosport, near Portsmouth, England, where one of the most important of the British dock-yards is located. There is a tradition that this spot had been used for some time by the British as a careening-ground for their ships, but the writer has not been able to find any proof of the fact. Mr. King's letter further states that scarcely had the British government commenced the works when the Revolution began, and the yard, together with the adjoining property of Andrew Sprowle, the British navy-agent, became confiscate and forfeited to the State of Virginia.

Virginia immediately commenced preparations for establishing a navy, and vigorous measures were adopted to that end. Several vessels were built or purchased. A rope-walk was established, which was probably at Gosport, though it is not certain. The published histories of Virginia and of the U. S. navy are alike singularly silent upon the subject of the Virginia navy, which was employed mainly for the defense of the bays and rivers of the State. Commodore Barron was appointed its commander-in-chief, being styled "Commodore of all the armed vessels of the Commonwealth." His two sons, Samuel and James Barron, and also Richard Dale, all afterwards distinguished officers of the U. S. navy, served under his command. At the conclusion of the war the State navy was disbanded.

The marine-yard was retained for the benefit of the Commonwealth, though no use is known to have been made of it until the year 1794. The lands adjoining the yard were sold in 1785. It was lent to the government by the State of Virginia, and was purchased by the United States several years later. Capt. Richard Dale* was appointed superintendent of the yard; Josiah Fox, naval constructor or master-builder; and William Pennock, navy-agent.

By an act of Congress passed March 27, 1794, the President had been authorized to procure by purchase or otherwise, equip, and employ to protect our commerce from the Algerines, 4 ships of 44 guns each, and 2 ships of 36 guns each. One of the ships thus authorized was laid down at the Gosport yard. Various causes combined to delay its completion, and at the end of the year 1795 it was still unfinished.

In a report of the Secretary of War, dated December 12 of that year, it is stated that about two-thirds of the live-oak frame of the frigate at Norfolk (Gosport) had been received, a part of the planking, the copper for sheathing and fastening, most of the iron-work, the masts and spars, and the most of the other materials necessary were in store or getting ready. The keel had been laid, and part of the frame bolted together ready for raising.

On the establishment of peace, early in 1796, between the United States and Algiers, work was suspended upon the ship at this yard, and such of the materials collected as were thought perishable were sold, and the rest put in store, Mr. Pennock, the agent, being employed to take charge of them. In June, 1797, the materials on hand at Gosport were valued at $52,989.

In July, orders were sent to Mr. Pennock to recommence work on the frigate at Gosport, for which the name "Chesapeake" had been chosen. During the same month, a brig of 200 tons, which had been built near the navy-yard, by Mr. Herbert, and which was nearly ready for launching, was purchased by the government and fitted out, under the name of "Norfolk." Capt. Thomas Williams, of Norfolk, was appointed superintendent, and afterward commander of the brig, being regularly commissioned in the navy.

Mr. Josiah Fox, who had been discharged from the yard upon the suspension of work in March, 1796, was now reappointed as naval constructor, and directed to proceed with the work upon the "Chesapeake," on a plan proposed by himself, by which the size of the vessel was reduced from a 44- to a 36-gun ship.

Considerable activity prevailed at the yard during the remainder of the year. A brig was purchased by the citizens of some of the principal towns of Virginia, and presented to the government. It was named the "Richmond," and was fitted out under the command of Capt. Samuel Barron, who had served in the Virginia navy during the Revolution.

The vessels of Commodore Truxtun's squadron frequently resorted to the yard for repairs and supplies, and to pay off their crews.

We also find that large quantities of bread and of some other articles of provisions were furnished during the year and the next succeeding for other stations. The yard was also made a depot for the supply of masts and spars to cruising-ships, and even to vessels fitting at Baltimore and Philadelphia.

By a report submitted to Congress by the Secretary of State, March 2, 1799, it appears that commissions were issued for the district of Norfolk, between July 9, 1798, and January 1, 1799, to 10 private armed vessels, mounting in the aggregate 65 guns.

In June, 1799, a brig, called the "Augusta," was purchased and fitted out at Gosport.

July 16, 1799, Commodore Samuel Barron was ordered to duty as superintendent of the yard; Mr. Pennock, the agent, not having exercised the degree of economy which the Department desired. In the following month, however, Commodore Barron was detached and ordered to the command of the "Constellation," at New York.

The importance of the Gosport yard, particularly as an equipping, recruiting, and victualing station, had now become so well established that the Secretary of the Navy resolved to make it one of the permanent navy-yards of the country. At his suggestion the Legislature of Virginia, by an act dated January 25, 1800, ceded to the United States the property known as Gosport for the purpose of establishing a navy-yard there, such cession to take effect as soon as the value of the property should be ascertained, and the Governor be satisfied that the United States were

* Capt. Dale was afterward appointed to the "Ganges," a purchased ship armed as a 24, and which, under his command, was the first vessel of the present navy to get to sea, sailing in May, 1798.

willing to pay the amount thereof to the Commonwealth.

In accordance with the requirements of this act, Thomas Newton, Jr., was appointed on behalf of the State of Virginia, and, by an order dated 7th of April, 1800, Mr. William Pennock was appointed to act on the part of the United States to ascertain, with Mr. Newton, the value of the lands required. In a letter bearing the same date, the Secretary of the Navy enjoined the greatest economy on the part of Mr. Pennock, and informed him that the only funds available, out of which the property could be paid for, were those appropriated for the building the "74-gun ships." He also intimated to Mr. Newton that the less the amount paid for the property the more there would be available for improvements, and suggested $100 per acre as a fair valuation.

In a report to the President, dated April 25, 1800, the Secretary, in recommending the establishment of permanent navy-yards, to be the property of the United States, remarks that a large part of the expense of building the frigates arose from handling the timber, owing to the confined space in which it was piled,—enough, he thinks, to have purchased ground and to have improved it. He states that the ground at Gosport had recently been ceded to the United States on condition of the payment of its value, which he hopes will not exceed $2000.

To the surprise of the Secretary, the value assigned to the land was $12,000, or $750 per acre. In a letter addressed to Mr. Pennock on the 7th of August, he expresses the opinion that the ground should have been given to the government without charge, but that it must be taken at the valuation named, though he considered it exorbitant. He also directs Mr. Pennock to have prepared plans for improving the timber-dock, a creek making up into the yard, and which was then used as such.

January 24, 1801, $12,000 were remitted to Mr. John Hopkins, of Richmond, Va., to be paid to the State, as the purchase-money of the Gosport lands, and under date of June 15, 1801, a deed was executed by Governor Monroe, by which the title and jurisdiction of the property were conveyed to the United States. This deed is now on file in the Bureau of Yards and Docks, Navy Department.

In a report submitted to the House of Representatives, April 27, 1802, by Mr. Mitchell, from the Committee on Naval Affairs, that gentleman stated that $12,000 had been expended for purchase and $4000 for improvements at Gosport without authority of law. Under date of March 10, 1802, Mr. Mitchell, from the same committee, reported that, in the opinion of the committee, Gosport and Charlestown, Mass., from the improvements already made, and from other circumstances, were the most eligible places for receiving and repairing the ships in actual service; and that, should any additional improvements be necessary at those places, they ought to be made. He also recommended the appointment of suitable persons to make plans for improving those yards, and the appropriation of $50,000 to carry the plans into effect.

The $4000 above referred to as having been expended in improvements at Gosport had been used to build a spar-shed, timber-shed, a bridge across a small creek, which separated the yard from the rest of Gosport at that time (outside of where the present north wall stands), and probably in part for wooden wharves along the water front, and a fence around the property.

We find mention of vessels laying up, repairing, and fitting out at this yard in 1800, 1801, and 1802. In 1801, a squadron under Commodore Dale fitted out. On the 27th of July, 1801, orders were sent to *heave down* the Chesapeake for repairs.

In October, 1801, a marine-guard was sent to Gosport Yard, and the navy-agent was directed to furnish it with quarters. It is probable that the wooden barrack-building which stood on about the same site that the brick barracks were afterwards built upon was erected for the purpose.

In April, 1802, Mr. Pennock recommended the building of a store-house for provisions, etc., within the yard. Up to that time private warehouses had been hired for the use of the navy stores.

April 26, 1802, Mr. Pennock was removed, and Daniel Bedinger was appointed navy-agent and superintendent of the navy-yard.

In April, 1803, $10,000 were sent to Mr. Bedinger to build a warehouse and a timber-shed at Gosport. We find by the correspondence of a little later date that, instead of expending the money for the purpose authorized, Mr. Bedinger built with it, first, a brick wall, beginning a short distance from the water-side, running along the north front of the yard, and down the west side to the creek which formed the southern boundary, and part of which forms the present timber-basin; secondly, a brick dwelling-house for himself within the yard, and which was afterward for many years used as the commandant's house, and, with what money was left, a very indifferent shed for timber, and a warehouse, which afterward had to be taken down to prevent its falling.

August 6, 1804, an order was sent to Mr. Bedinger detaching the marine-guard from the navy-yard and ordering it to Washington.

In May, 1805, Bedinger was ordered to repair the wharves, which had been represented by a citizen as being much out of order. We find, under date of February 6, 1806, a report from Mr. Thomas Turner, accountant of the navy, in which that gentleman states that $42,748.78 had been expended in improvements and repairs at this yard, and yet, except the wall, scarcely anything of permanent value seems to have been done. The wharves were, and continued to be for many years later, of wood, and, of course, in waters infested with the *Teredo navalis*, were constantly requiring extensive repairs, and often complete renewal. During the summer of 1806 we find several gunboats and ketches fitting out and laying up, under the direction of Lieut. Arthur Sinclair.

On the 28th of November, 1806, Capt. Stephen Decatur was ordered to superintend the building of 4 gunboats at Norfolk. He seems to have superseded Lieut. Sinclair in his duties also, although that officer continued on duty under him. In July, 1807, Mr. Bedinger was ordered to contract for materials for 10 additional gunboats, and, a little later, to contract for building the same. Capt. Decatur was ordered to super-

intend the construction. We now find Capt. Decatur addressed by the Department as "Commanding naval forces at Norfolk," and he appears to have continued in this command until November, 1811; his force consisted of the frigate "United States," which he himself commanded, and of such gunboats and other vessels as were from time to time put into commission. He appears, however, to have had no immediate charge of the navy-yard, which continued under the control of the navy-agent.

In November, 1807, a marine-guard was again ordered to the yard. February 10, 1808, Bedinger's appointment was revoked, and Theodore Armistead appointed in his place as navy-agent and superintendent of the navy-yard. We now find complaints lodged against Bedinger for having used the public wharves and property in repairing his own vessels, though whether these charges were substantiated does not appear.

The agents up to this time seem not to have been required to give bonds, and, in fact, to have been held very little responsible for their acts, the Department having no military control over them.

In March, 1808, Mr. Armistead was authorized to contract for 50 tons of native hemp, and to have it made into cordage for the navy. The work was done by private manufacturers, however, and not at the yard.

In April of the same year authority was sent to Mr. Armistead to build a new timber-shed and a warehouse.

In May, 1809, an order was sent to build a powder-magazine in the yard. This stood near the creek, now timber-basin.

In June, 1810, on account of the uncertain relations with Great Britain, a small cruising squadron was ordered to Norfolk under the command of Commodore Decatur.

July 7 of the same year the Department, having become tired of the practice of operating the navy-yard under irresponsible civil administration, ordered Commodore Samuel Barron as commandant of the yard, the gunboats, the officers, and men. The navy-agent was, however, still continued as purchasing and disbursing agent, and, as such, in charge of "all stores other than military." The following letter, addressed to Commodore Barron by the Secretary of the Navy, is of some interest as being the first instructions to the commandant:

"NAVY DEPARTMENT, September 29, 1810.

"SIR,—In defining your duties and your authority in the yard at Gosport, it will be sufficient for me to state that all the military stores of every description will be under your care; that the direction of all improvements in the yard and of all reparations to our vessels at the yard are committed to you; and that within the yard you are to have the entire, undivided command.

"The navy-agent, as heretofore, will have the charge of all stores other than military, and he must have a warehouse at the yard for their safe-keeping, with perfect liberty of ingress and egress.

"PAUL HAMILTON."

The house which has been mentioned as having been built by Mr. Bedinger was assigned to Commodore Barron as a residence. It was at the time occupied by the storekeeper or clerk of the yard, an eccentric person of the name of Thomas Dulton, an ex-shipmaster. Although the navy-agent was nominally superintendent of the yard, Capt. Dulton had been in immediate charge of it for some years, performing all sorts of offices therein, ringing the bell and mustering the workmen himself. Many singular anecdotes of him are preserved among the traditions of the yard.

Commodore Barron had scarcely entered upon his command when, on the 29th of October, 1810, he was overtaken by death. Lieut. Robert Henley, under date of November 10, was ordered to assume temporary command of the yard until a relief should be ordered.

In May, 1811, Capt. Samuel Evans was ordered as commandant, and from that time we find lieutenants, masters, medical officers, boatswains, and gunners attached to the yard and to the vessels in ordinary.

Capt. Evans continued in command until August 10, 1812, when Capt. John Cassin was ordered to relieve him. Capt. Cassin had, as lieutenant and master-commandant, been for several years attached to the navy-yard at Washington, part of the time as superintendent and part of the time second in command. The Department seems to have regarded him as a valuable dock-yard officer, and the pay and allowances of a captain commanding a separate squadron were given him in his new position, although he was almost the junior captain on the list when ordered to the command.

In August, as above stated, Capt. Evans was relieved by Capt. Cassin. Very little of interest occurred during the remainder of the year. In October a blacksmith's shop was erected. By the letters of Capt. Cassin we find that considerable quantities of timber, lumber, and other stores, and of munitions of war, were furnished from time to time from the navy-yard to the army in the vicinity, particularly to the engineer officers, who were erecting fortifications. During the summer, Capt. Cassin's little force was increased by an armed yacht under Lieut. E. P. Kennedy.

Early in February, 1813, Capt. Charles Stewart, in the "Constellation," which had fitted out at Washington, in attempting to get to sea, was met by a large force of British ships which were seen entering the Chesapeake as he came abreast the Horseshoe. It being calm when he discovered the enemy, Capt. Stewart kedged the "Constellation" from the Horseshoe to a position in the Elizabeth River, just opposite Fort Norfolk, now the navy magazine.

Capt. Stewart now became commanding officer of the station in general by virtue of his seniority, though Capt. Cassin continued to command the gunboat flotilla, and made his reports directly to the Department. The most untiring vigilance, activity, and skill were now required to defend the frigate and flotilla from capture, and at the same time to annoy the enemy as much as possible. Both objects were successfully accomplished.

On the 30th of November, 1813, Mr. Jones, the Secretary of the Navy, in answer to a resolution of the House of Representatives calling for information on the subject of navy-yards, submitted, among other papers, the following

letter of Capt. Cassin, giving a description of the yard at the date of the report:

"NAVY-YARD, GOSPORT, May 25, 1813.

"SIR,—I have the honor to inclose you a statement of the accommodations provided in this yard, with the number of officers and men attached. . . . The commander's dwelling of brick, two stories high, made comfortable quarters; marine barracks, miserable huts of wood, wanting much repair; the officers' quarters are low two-story frame buildings, the whole 150 feet from the west wall, which is only 5½ feet high; the northwest is bounded by warehouses and timber-sheds, having to extend a fence on the east end to low-water mark.

"The marine hospital stands in the centre of the yard, two stories high, was formerly occupied as boatswain's and gunner's store-rooms, built of wood, the centre of which is occupied as the hospital, the garret as rigging-loft, and lower part gunner's store, store-keeper's office, purser's issuing-room and office.

"The blacksmith's shops, begun of brick, 165 feet by 50, including anchor and plumber's shops, not completed, the old shops being dangerous to heat a large fire.

"One large timber-shed, 300 feet long, with brick pillars, and 50 feet wide.

"One small shed for the armorer and plumber; two sheds appropriated, one for the joiners, the other for mast-makers.

"JOHN CASSIN."

In April, 1815, an order was sent to Capt. Cassin by the Secretary of the Navy to raise the hulks which had been sunk in the channel during the war, and which constituted a serious obstruction to the narrow channel.

During the summer of 1816, under an order dated the 7th of May of that year, an examination was made by the Board of Navy Commissioners, then consisting of three of the most distinguished officers in the navy, viz., Commodores John Rodgers, Stephen Decatur, and David Porter, to ascertain the best manner of defending the Chesapeake Bay, and also to determine the most advantageous site for a naval station and depot within its waters.

Differing somewhat in their opinions, especially as to the best location for a naval station, each officer made a separate report. Commodore Rodgers favored a position in York River, 10 miles above York, called the Clay Banks; Commodore Porter, the mouth of the St. Mary's River; and Commodore Decatur, the site already occupied at Gosport.

No action seems to have been taken upon the reports of the board, and no material changes occurred for the next few years.

In the summer of 1817 the keel of a line-of-battle ship was laid. The timber for this ship had been in store for years, having been collected under the provisions of the act of Congress of February 25, 1799, and subsequent amendments. The name afterward chosen for this ship was "Delaware." We find authority given during the same summer to build a saw-shed and a steam-stove.

In January, 1818, authority was sent to Capt. Cassin to remove or pull down the old hospital which was situated within the yard. A small frame building, located near the present dry-dock, was afterward used for some years as a hospital.

In June, 1818, the ship "Alert" was assigned as receiving-ship at Norfolk, Commander Jesse Wilkinson being ordered to command her.

In September, 1818, Capt. Arthur Sinclair was ordered to this navy-yard to superintend the construction of the "Delaware" under Capt. Cassin. Capt. Sinclair is soon after addressed as "Commanding Naval Officer Afloat" at Norfolk, and held a command separate from the yard for several years later. The receiving-ship was a part of his command, and all recruiting was done under his direction. We find about this period, and for some years after, considerable quantities of timber, plank, knees, masts, and mast-pieces, and also of cordage furnished from Gosport to the navy-yards in other parts of the country.

In the latter part of 1818, the old wooden buildings used as marine barracks were pulled down and a brick building put up in their place. The line-of-battle ship "New York" was also commenced in this year.

In October, 1820, the "Delaware" was launched and housed over, not being required for service immediately.

In June, 1821, Capt. Cassin was relieved by Capt. Lewis Warrington. During the summer of that year Capt. Warrington was directed to fill in the old timber-basin. This was a shallow basin, originally formed by a creek or cove, and included the spot where ship-house B was afterward built; its banks were protected by wharf-logs, with a wharf across the entrance provided with slips for boats to enter. A ship-house was authorized to be built over the "New York"; this was afterward lettered A. A pair of masting-shears was also authorized.

In August, 1821, a school for midshipmen was established under the charge of Chaplain David P. Adams, on board the "Guerriere," frigate, then in ordinary at Norfolk.

Improvements to the navy-yard buildings, repairs to the wharves, filling in and leveling the grounds, were carried on from year to year under the current appropriations.

In December, 1824, Capt. Warrington was relieved from the command of the yard by Master-Commandant James Renshaw.

On the 25th of May, 1825, Commodore James Barron relieved Capt. Renshaw as commandant of the yard.

On the 28th of November, Commodore Barron, in answer to a complaint of the Secretary of the Navy that too long a time was required to repair and fit out ships, informed the Secretary that the delays were immediately owing to want of proper workshops, store-houses, and a dock, and proposed a plan for the improvement of the yard, which involved the purchase of more land (the yard being altogether too confined for the purpose for which it was required), the erection of suitable buildings and shops, and of a floating dry-dock. He furnished a plan and estimates for the last. He especially urged the inexpediency of erecting wooden wharves and docks in waters infested with the *Teredo navalis*, which destroyed the structures at the water's edge, and left the substructure to form actual obstructions in the channel.

The question of purchasing additional ground seems thus to have been re-opened, and under

date of February 26, 1826, Mr. King, the navy-agent, suggests to the Navy Department the plan of applying to the county court to appoint a jury to appraise the lands required by the government. This suggestion was approved by the Secretary, but seems to have been a very slow process.

On the 22d of May, 1826, a resolution of Congress of the following purport was approved, viz.:

The President to cause an examination and accurate survey to be made by skillful engineers of a site for a dry-dock at the navy-yards at Portsmouth, N. H., Charlestown, Mass., Brooklyn, N. Y., and Gosport, Va., respectively; and that such engineers be required to state the dimensions necessary for such docks, the advantages of each of the above-named establishments, and the objections that apply to either, with a detailed estimate of the expense of a suitable site, and of constructing a dock at each of said places; and the President be requested to communicate the same to Congress in the first week of the next session.

On the 26th of July, Col. Baldwin (the civil engineer before mentioned) was appointed by the Department to make the required surveys. The first spot selected at Gosport as the site of the dock was at the northern side of the entrance of the creek, now forming a timber-dock; this site was chosen as being the best in the yard as it then existed.

During the same year (1826) the frigate "St. Lawrence" was laid down, and a ship-house built, afterward lettered B.

On the 3d of March, 1827, Congress passed an act entitled "An act for the gradual improvement of the navy of the United States," by which there was appropriated the sum of $500,000 per annum for six years, to be applied to the purposes specified in the act.

By section 4 of the act, the President was authorized to cause to be constructed two dry-docks on the most approved plan, for the use of the navy of the United States; one of the said docks to be erected at some point to the south, and the other to the north, of the Potomac River.

By section 6, the President was authorized to cause the navy-yards of the United States to be thoroughly examined, and plans to be prepared for the improvement of the same and the preservation of the public property therein; from which plans, after they should be sanctioned by the President, no deviation should be made but by his special order.

On the 29th of March, 1827, Mr. King, the navy-agent, reported that the lands from Jefferson Street, along the line of Third Street to the county road, and thence down to the water, could be purchased for $7825. He was authorized to make the purchase, and also of such other lands adjoining the yard on the south as should be deemed necessary, and was directed to consult with Commodores Bainbridge, Morris, and Chauncey, who then constituted the board charged, under authority of the act above alluded to, with the examination of the yards and the formation of plans for their improvement.

The Board of Commissioners, of which Commodore Bainbridge was president, during the winter of 1827–28 made an elaborate plan for the improvement of the yard, based on a thorough survey of the yard and the adjacent waters by Col. Baldwin.

On the 17th of June, 1833, the anniversary of the battle of Bunker Hill, the dock was opened for the reception of the line-of-battle ship "Delaware," the first liner built at Gosport, and the first national ship ever docked in a dry-dock belonging to the United States.

The line-of-battle ship "North Carolina" was soon afterward admitted to the dock.

Commodore Warrington, who had assumed command of the yard May 26, 1831, continued in it until the 7th of October, 1840. The yard was constantly used in the mean time for fitting out, refitting, repairing, and laying up the ships and vessels of the navy.

The sloop "John Adams" was built in 1830. The frigate "Macedonian" was rebuilt here between the years 1832 and 1836. The surveying-brig "Pioneer" was launched in 1836. The line-of-battle ship "Pennsylvania" became the receiving-ship in 1837. The sloop "Yorktown" was commenced in 1835 and launched in 1839.

Of the old buildings that were standing in 1837, the ship-houses, the office-buildings along the north wall, the commandant's house, and a portion of the marine barracks, were still standing in 1840; the rest had all been removed or rebuilt.

Commodore W. B. Shubrick assumed command of the yard in October, 1840, and retained it until October, 1843. A plan of the yard, made under his direction by Capt. Sanger and received at the Bureau of Yards and Docks in November, 1842, shows little progress up to that date beyond what is mentioned above,—the continued appropriation for "gradual improvements" having ceased. A blacksmith's shop and turning-machine and a foundry and plumbery had been added to the steam-engine house, and some other store-houses had been begun.

The steamer "Union" was laid down at the yard in 1841 and launched in 1842. The store-ship "Southampton" was commenced in 1842.

In October, 1843, Commodore Shubrick was relieved by Commodore Jesse Wilkinson as commandant.

In 1842 an appropriation was made by Congress for a dredging-machine for this yard, which was completed the following year, and successfully used for deepening the channel in front of the dry-dock and along the wharves; the earth brought up was used for filling up where needed in the yard. During the year 1843 the ground around the dry-dock was graded and the pavement relaid; by this the dock was protected from injury to which it had been subject from filtration.

The brig "Perry" was laid down in 1843, and some additional machinery was erected in different shops during the same year. The quay-wall was completed during that and the following years, *i.e.*, 1843–44, as far as ship-house B.

The sloop "Jamestown" was laid down in 1843 and launched in 1844. In 1845 another store-house, No. 16, was built. A bridge across the timber-dock was completed. The dock itself was still in an unfinished state, no appropriation having been made for several years. Work was suspended on the quay-wall in 1845 for the same reason. A new building-slip was commenced in 1845 under special appropriation. The

store-ship "Southampton" was launched the same year.

On the 26th of August, 1846, the lot of ground opposite the navy-yard, on the Norfolk side of the Elizabeth, and known as Saint Helena, was purchased and added to the yard. This ground was needed for ordnance purposes. Jurisdiction over it was ceded to the United States by an act of the General Assembly of Virginia, dated March 22, 1847.

Commodore Lawrence Kearny became commandant on the 1st of June, 1847. Some progress was made that year upon the launching-slip previously spoken of. Another store-house, No. 13, commenced the year before, was finished. The frigate "St. Lawrence" and the brig "Perry" were launched. The former had been on the stocks for over twenty years. The steam-frigate "Powhatan" was laid down.

January 19, 1848, Commodore John D. Sloat was ordered to relieve Commodore Kearny as commandant.

In 1848 a small appropriation was made by Congress for continuing the quay-wall, and was applied to build a coffer-dam for the north wall of the timber-dock. Appropriations were also made for a new pair of masting-shears, for additional machinery, for various shops, and for improvements at Helena.

In September, 1849, Fort Norfolk and the grounds about it were turned over to the navy by the War Department for the establishment of a magazine for powder and shells. Work was immediately commenced upon the shell-house. A building near the site of the present saw-mill, outside of the yard, when built, had been used as a magazine for some years previously. During the same year, building No. 51 was erected, also some brick stables. An engine-house to the smithery was commenced. A gun-park, a coal-house, and a landing-wharf were built at Saint Helena. Work upon the quay-wall progressed as far as the appropriation would permit.

Between the years 1850 and 1860 great progress was made in improving the yard, under current appropriations, while at the same time great activity prevailed in building, repairing, fitting out, and laying up the ships and vessels of the navy. The steam-frigate "Powhatan" was launched in 1850. Work upon the quay-wall was steadily continued from year to year. The timber-dock was finished in 1854, together with the bridges across it. A culvert was built in 1853 to drain the lands adjoining the yard and to conduct the water from them into the dock, thereby considerably freshening that in the dock. The culvert was built of brick laid upon a pine-plank floor.

There being but a limited supply of fresh water at Gosport, appropriations were made in 1850 for building cisterns for collecting rain-water; one was completed in 1851, with a capacity of 38,000 gallons. Afterward two large reservoirs were built,—one completed in 1856, holding 124,000 gallons, with a head, when full, 14½ feet above the grade of the yard. The other reservoir was completed in 1857; its capacity is 128,000 gallons.

Work upon the magazine and the keeper's house at Fort Norfolk was commenced in 1851, but not completed until 1856. A reservoir was built near the magazine to contain 90,000 gallons of water. A sea-wall and landing-wharf were also built, and two old houses converted,—one into a store-house and the other into a filling-house.

Building No. 19, a rigging-loft, armory, and offices, and the entrance-gateway, was erected in 1851–52. A building was constructed in 1853 near timber-shed No. 33, which was designed for a saw-mill and burnetizing-house. It was entirely devoted to the latter purpose, however, and in 1856 a saw-mill was erected at the south end of the yard, on one of the sites intended for a dry-dock. A culvert was constructed in 1855 from the burnetizing-house to the timber-dock.

Dredging was carried on from year to year during the decade, deepening the channel and furnishing material for filling in the low places of the yard, and the space between the old shore-line and the quay-wall as well as at Saint Helena. A new dredging-machine was built in 1854.

Grading the yard was also attended to; pavements were laid around the buildings, and brick foot-walks through the yard in various directions; roads were macadamized, and a thorough system of drainage established, by which the sanitary condition of the yard was much improved.

Gas for lighting the yard and buildings was introduced in 1855.

On the removal of the saw-mill in 1855 and 1856, new machinery was added to the machine-shop, and a new foundry was erected, completed in 1859, on site 41, designed in the "approved plan" for an iron and copper store. A boiler-shop was commenced to the northward of the machine-shop. A new engine for pumping out the dry-dock was completed and set up in 1856. A large and commodious building was erected in 1856 as a receiving and issuing store for the department of provisions and clothing. It was located on the new-made ground, just south of the entrance of the timber-dock, into which a culvert from its cellars leads. An ordnance building, not on the "approved plan," was commenced in 1858 and completed in 1859. Gun and shot platforms were built at Saint Helena, and also at the yard south of the ship-house A.

Two large lifting-cranes were erected on the quay-wall in 1857, and a large amount of machinery of various sorts was added to the different shops through the yard. Alterations, additions, and improvements were made to some of the buildings under the appropriation for "repairs of all kinds." Rail-tracks were laid down at Saint Helena, and also at the yard; in the latter connecting the anchor-racks near the dry-dock, the different shops and store-houses, with the wharf near the shears.

Considerable building, repairs, etc., of ships was carried on during the same period. In 1855 the magnificent steam-frigates "Roanoke" and "Colorado" were laid down; these vessels were finished and launched in 1857. The steam-sloops "Dakota" and "Richmond" were begun in 1858 and launched, the former in 1859, and the latter in 1860. A purchased steamer called the "Dispatch" was rebuilt in 1859 under the name of "Pocahontas."

The following were the commandants of the yard during this period, viz.: Capt. Silas H. Stringham (late rear-admiral), from 17th Feb-

ruary, 1851, to 1st April, 1852; Capt. Samuel L. Breeze, from 1st April, 1852, to 10th May, 1855; Commodore Isaac McKeever, from 10th May, 1855, until his death, which occurred on the 1st of April, 1856; Capt. Thomas A. Dornin (late commodore), from 6th May, 1856, to 30th April, 1859; Capt. Charles H. Bell (late rear-admiral), from 30th April, 1859, to 1st August, 1860, when he was relieved by Commodore Charles S. McCauley.

On the 1st of April, 1861, there were, at the yard or in the stream, the following ships and vessels of war, viz.:

Ship-of-the-line "Pennsylvania," 120 guns, receiving-ship.

"Ship-of-the-line "Columbus," 74 guns, in ordinary.

Ship-of-the-line "Delaware," 74 guns, in ordinary.

Ship-of-the-line "New York," 74 guns, on the stocks.

Steam-frigate "Merrimac," 40 guns, under repairs.

Frigate "United States," 50 guns, in ordinary.

Frigate "Columbia," 50 guns, in ordinary.

Frigate "Raritan," 50 guns, in ordinary.

Sloop "Plymouth," 22 guns, ready for sea.

Sloop "Germantown," 22 guns, ready for sea.

Brig "Dolphin," 4 guns, ready for sea.

In addition to these, the frigate "Cumberland," 24, the flag-ship of Flag-Officer Pendergrast, commanding the Home Squadron, was also lying off the yard, fully manned.

The evacuation of the yard; the destruction of the government property; the scuttling of the "Germantown," "Plymouth," "Dolphin," and "Merrimac"; the occupation of the yard by the rebels; the raising and rebuilding of the "Merrimac" as an ironclad under the name of "Virginia," though to the public always known by her old name; the destruction by her of the frigates "Congress" and "Cumberland"; the opportune arrival of the "Monitor" under Lieut. Worden (now rear-admiral), by which the "Merrimac" was driven back to Norfolk, and afterward held for months blockaded in the Elizabeth; and the capture of Norfolk by the U. S. forces under the immediate direction of President Lincoln in May, 1862, are all well-known matters of history.

The vessels of Admiral Goldsborough's squadron participated in the attack on Norfolk by shelling the batteries at Sewell's Point. The ironclads "Monitor" and "Stevens," with some wooden steamers to act as rams, endeavored to draw out the "Merrimac," but without success, she declining to engage.

The city of Norfolk was surrendered by the civil authorities to Gen. Wool on the 10th of May, 1862. Early on the following morning the "Merrimac" was blown up by her own people to avoid capture by Admiral Goldsborough's squadron. The navy-yard was fired and abandoned at the same time.

Admiral Goldsborough immediately moved his flag-ship to Norfolk, anchoring off the naval hospital. By his order, sanctioned by the President, the forts along the shores of the Elizabeth, and as far down as Sewell's Point, and also those for some distance up the Nansemond, which had been erected by the rebels, were dismantled and blown up. Lieut. Selfridge was charged with the work of destroying the former, and Lieut. John Watters the latter.

Admiral Goldsborough took possession of all the naval property in the vicinity, including the yard, the magazine, and the naval hospital. By his order a careful examination of the yard was made by Lieut. Selfridge, who, under date of May 19, reported substantially as follows:

The only buildings uninjured by fire were 5 brick dwellings, the boiler-shop, the foundry, and one wooden timber-shed. He found and collected about the yard a quantity of chain-cables, sheet- and bolt-copper, 15 old ships' galleys, smiths' tools, and detached pieces of machinery belonging to the smithery, a quantity of cordage, a diving-bell, a large quantity of oak-timber, some pine planks, and 50 pieces of spar-timber, 150 barrels of pitch, fourteen 32-pounder guns, two 100-pounder rifles, 140 old guns, worthless, and three 32-pounder gun-carriages, a number of water-tanks, great quantities of old iron and of pig-ballast, a number of iron plates punched for bolting, 30 anchors, and a number of kedges. He found some of the machinery in the machine-shop in good condition and some injured.

On the 20th of May, 1862, Capt. John W. Livingston was ordered to the yard as commandant. He at once commenced the work of putting the yard in as good order as its ruined state would permit, and of gathering up the public property, a large quantity of which was found outside in various places. Many articles were restored by the citizens, or pointed out so that they could be taken possession of. A considerable quantity of timber, 3 fire-engines, and a number of guns were among the things so restored. Two diving-bells, anchors, shot, shell in boxes, and many other articles were recovered from the water, having been thrown overboard from the quay and the wharves.

Repairs were commenced as soon as possible, particularly upon those shops which were most immediately needed. The machine-shop was put in working order in a very short time. An appropriation was made to restore the dry-dock, which the rebels had temporarily disabled by destroying the gates. New gates were constructed and the dock put in working order during that year.

Considerable appropriations for the fiscal years ending July, 1865, 1866, 1867, respectively, were made by Congress for restoring the various workshops, stores, wharves, shears, cranes, and machinery in the yard. The objects most needed to make the yard a repairing and refitting station were first attended to, in order that the immediate requirements of the service might be met.

The arrangement of store-houses was systematized, in which, by the way, this yard set the example to most of the others in the country; separate buildings or parts of buildings were assigned to the different departments, whose heads were made responsible each for his own stores. By this means the public property was much better cared for and preserved than under the old system, the accountability made much more perfect, and the facility for handling and issuing stores vastly increased.

The restoration of the yard has been steadily progressing under the current appropriations, which, however, have been very small since

1867, and only under the head of "repairs of all kinds."

The following is a list of the buildings which have been repaired or rebuilt, though in some instances the purposes to which the buildings are devoted have been changed from those originally designed; the new arrangement is here given, viz.:

No. 9. Smithery, etc.

No. 11. Construction store-house.

No. 13. Equipment-store.

No. 14. Provisions and clothing-store. This building was substituted in 1870 for the victualing-house, which had been rebuilt on the new-made ground just south of the entrance to the timber-dock, but which commenced to settle and became in danger of falling; to prevent which the building was taken down.

No. 15. Steam-engineering store-house.

No. 16. Ordnance building.

No. 17. Yards and docks store-house.

No. 18. Ship-carpenters' shop, just north of the dry-dock.

No. 19 (one of the entrance-buildings, so called). Contains offices, drafting-rooms, court-martial-room, cordage-store, navigation-store, and marine guard-room.

No. 57 (the other entrance-building). Rigging-loft and sail-loft.

Nos. 20 to 25, both inclusive, as marked on the plan, have never been built upon, and some of the numbers have been re-assigned, viz.:

No. 21. Saw-mill, in the south part of the yard.

No. 22. Foundry.

No. 23. Boiler-shop.

No. 28. Mast-house and house-joiners' shop.

No. 29. Boat-builders' shop, boat-house, block-makers' and ship-joiners' shops.

No. 30. Timber-shed and furniture store-room for the construction department.

No. 31. Timber-shed, paint-shop, and sail store-rooms.

Nos. 36, 37, and 38. Machine-shop. These constitute one building, and have recently been so extended as to join them with the foundry.

No. 37. This number is now given to a small building on part of the foundation of the former ordnance-building, just south of No. 9; it is used as a plumbers' shop.

The officers' quarters are now lettered, viz.: A, commandant's; B, executive-officer's; C, surgeon's house; and the two houses on the site marked 39 are lettered D and E.

No. 39. This number is now used to designate a new building, which has been constructed as a workshop for the department of yards and docks. It is built of the materials of the victualing-house, which was taken down in 1870, and is located south of No. 12. In excavating for the foundations of this building, a number of human remains were found, to account for which several theories were advanced. By consulting a very old plan of the yard, which is without date, but which was made about the year 1816, it is found that a burying-place existed on that spot at that time; it was near the bank of the stream or creek, a part of which now forms the timber-basin. The remains are, therefore, no doubt, those of U. S. sailors and marines.

In addition to the buildings above mentioned, there are in the yard stables, sheds, tar-, pitch-, lime-, and oil-houses, watch-houses, offices, etc., in various parts of the yard. The car-tracks have been restored, wharves repaired, new shears and a large lifting-crane have been erected. The reservoirs for rain-water, with their system of pipes leading to various parts of the yard, are in good condition.

A contract was entered into by the government with companies of wreckers, by which, on terms advantageous to the government, nearly all of the hulks of the vessels destroyed at the yard, as well as of the "Merrimac," have been raised and broken up, thus clearing the channel.

Dredging has been carried on from time to time, and is going on now, for deepening the channel off the yard, the design being to gain 24 feet of water at least. The earth removed is used for filling in where needed in the yard.

The following have been the commandants of the yard since its repossession by the United States, viz.:

Capt. John W. Livingston, from May 20, 1862, to November 16, 1864; Capt. John M. Berrien, from November 16, 1864, to October 7, 1865; Commodore Robert B. Hitchcock, from October 31, 1865, to August 7, 1866; Rear-Admiral S. C. Rowan, from August 7, 1866, to July 23, 1867; Commodore A. H. Kilty, from August 15, 1867, to October 1, 1870; Rear-Admiral C. H. Davis, from October 1, 1870, to July 1, 1873; Commodore Thomas H. Stevens, from July 1, 1873, to 1876; Commodore J. B. Creighton, 1876–79; Commodore A. K. Hughes, 1879 to present time. —*Edward P. Luce, Captain U.S.N.*

Navy-yard, Pensacola, Fla. The navy-yard built on Tartar Point, Pensacola Bay, was located about the year 1825, and operations were begun in October, 1826, by a party of mechanics from Boston, under charge of Lieut. Cunningham, of the navy.

In 1836 its importance had become so far recognized that Commodores Charles Stewart, A. J. Dallas, and William C. Bolton were appointed commissioners to make thorough examination and report upon a full and complete plan for the development of the yard as a first-class station. Congress made liberal appropriations from year to year, until at the beginning of the civil war it had become one of the best-equipped stations in the country,—having a floating dry-dock and all appliances for the docking, repairing, and building of our ships-of-war. The sloops "Seminole" and "Pensacola" had been built, and timber had been stored for other vessels, when the war of the Rebellion came on, and the yard was betrayed into the hands of the rebels through the treachery of Commander E. Farrand and Lieut. Frank T. Renshaw, both men of Northern birth, education, and citizenship, but who had married in the South. The insurgents held the yard until the autumn of 1862, when the momentous struggle before Richmond compelled the rebel government to concentrate its forces, and the yard was evacuated, together with other points on the Gulf and Atlantic coasts. Before the evacuation, however, the yard was gutted of all stores and material, and the buildings were mostly destroyed, including the beautiful and commodious naval hospital, located a mile distant from the yard. To insure the more complete destruction of the fine row of officers' quarters, loaded

shells were placed in every fire-place when the buildings were fired.

Upon the reoccupation Admiral Farragut fitted up a temporary machine-shop, and during the rest of the war the yard was of great service as a depot of repair and supplies for the Gulf Squadron.

Since the war the yard has been gradually improved and rebuilt,—a sectional floating dry-dock of iron is nearly completed, and at the last session of Congress $150,000 was appropriated to put the yard in a more perfect state of efficiency.

Situated on the Gulf, the place is generally healthy, but the dreaded visitations of yellow fever render the station unpopular with the service, and few officers care to go there, unless citizens of the South and accustomed to its climate.

The first commandant was Commodore Lewis Warrington, for whom the principal village in the naval reserve, comprising some 1600 acres, was named. Some of his successors were Commodores Woolsey (father and son), Chauncey, Dallas, Latimer, Tattnall, Rousseau, Stribbling, Newton, McIntosh, James Armstrong, Smith, Green, Middleton, and Cooper, Capt. Belknap, and Commanders J. F. Armstrong and J. F. McGlensey.—*G. E. Belknap, Captain U.S.N.*

Navy-yard, Portsmouth, N. H.—Among the state papers of New Hampshire relating to naval affairs, we find recorded the following:

No. 21.

6th Congress, 2d Session. } Naval Establishment and its expenses.
Naval Department, Jan'y 12th, 1801.

Ground purchased in Portsmouth for a Navy-Yard.

Harrison Grey Otis,
Chairman of Committee on Naval Affairs.

October 1st, 1800, Portsmouth, N. H.	For purchase of Land	$5,500
	Improvements	26,304
Fifty-Eight Acres.		$31,804

As soon as the government took possession of the island work commenced at once in repairing a building for the use of the superintendent of the yard, removing the material from the adjoining island, building a shed for timber, and a wet-dock for seasoning the same.

In 1803 a house was erected for a dwelling, barracks for marines, and a bell-tower built. An octagon fort, of earth and heavy timber, with embrasures for eight heavy guns, also platforms for the same, was built upon the hill, and a flag-staff erected.

Nothing more was done on the yard, except to collect timber for building purposes, until 1806, when a first lieutenant of marines, Mr. J. M. Gamble, with 1 sergeant, 2 corporals, 15 privates, and 2 musicians were ordered by the Navy Department to this station as a garrison to protect government property on the island. A small gun-boat, called the "Bee," was ordered for the protection of the harbor, and to act as guard-ship. No work other than the clearing of the island and erection of sheds, smith-shop, saw-pits, and the building of a few small boats for the use of the yard, was done until the year 1812, when the government changed its former policy respecting navy-yards, and placed them under the command of a naval officer as commandant.

On the 4th of October, Capt. Isaac Hull took command of the navy-yard as commandant. Sailing-Master Nathaniel Stoodley was ordered to the command of the gunboats at the yard.

In March, 1814, the keel of the 74-gun ship "Washington" was laid, two sheds having been removed to make room for the ways. Work progressed upon this ship very rapidly; by the following September she was well advanced, and a house built over her (now ship-house No. 5); she was not launched until January of the year following. During the year that the "Washington" was building, much anxiety was felt lest the enemy should send a party by night, in boats, and burn her, and precautions were taken to prevent it. The "Washington" was launched in July, 1815, peace with England having been declared the February previous.

The launching of so large a ship as a 74 was an event of uncommon occurrence in this vicinity, and thousands of persons were attracted hither by it. On the day of the launch the weather was fine, and the shores lined with an enthusiastic multitude; as the great mass began to move slowly out of the ship-house the cheers were deafening; the band played a national air, while the roar of the cannon from the surrounding forts added to the din.

On the 1st of July, 1815, Capt. Hull was relieved from command of the yard by Capt. Thomas McDonough. From 1815 to 1818 there was no work done on vessels at the yard, the entire force being employed in laying out walks and making preparations to erect buildings. Quite a number of negro seamen were employed at the yard in the ordinary force, but orders from the Department caused their discharge, and none were allowed to be employed excepting as servants to officers.

In February, 1817, orders were received to lengthen the ship-house (now No. 5) 12 feet, and to build a ship-of-the-line to measure 9 feet more in length than the "Washington"; accordingly, on the 15th of April the keel of the "Alabama," 74, was laid in the lengthened ship-house.

In July, 1818, Commodore McDonough was relieved as commandant by Capt. Charles Morris. The first portion of wall at this yard was laid west of the ship-house, in March, 1819, and the earth filled in the wall was extended some 500 or 600 feet to the west. The force on the yard was largely increased, as a new ship-house was building to the west of the old one, and the construction of the "Alabama" was being pushed forward. In 1820 the ship-house (No. 4) was finished and the "slip" begun. Capt. E. Watson, U. S. marine corps, received permission to erect barracks for the marine-guard of the yard, using an old house, which is now on the island, in addition to the small one now occupied by them. The work was almost entirely done by the guard, and the expense of the new barracks was trifling; it stood where the gun- and shot-park now stands.

The schooner "Porpoise" was begun in September, 1820, and launched on the 26th day of November following. Her cost when ready for sea was $25,529; her tonnage, 178; battery, ten 6-pounders and one long 18-pounder. In 1821 $12,000 were appropriated for improvements on the yard. The store-house and offices was commenced this year. This building was the first brick one erected in the yard. The keel of the

"Santee," a 44-gun frigate, was laid in the new ship-house, and the present timber-dock with its sea-wall was finished this year.

In May, 1821, application was made to the State of Maine "for the cession of the jurisdiction of the island on which the navy-yard at Portsmouth is situated," and in the month following it was granted; the State reserving the right to serve processes on the yard and to arrest criminals.

Wooden buildings for officers' quarters were erected upon the site now occupied by those elegant structures of brick. In May, 1823, Capt. Wm. M. Crane relieved Capt. Morris as commandant.

The store-house had advanced so far towards completion that the officers were removed into it on the 1st of January, 1824, together with the naval stores. The cost of this building was $4000. In 1827 the addition was made to this building (which may be noticed by the roof being higher), and it is now the stores of steam engineering, equipment, navigation, and sail-loft, the cost of which was $15,000. The old wooden building which had been used for offices was removed to the rear of the marine barracks, and used as a cook-house for the marines and men of the ordinary. The stone wall from the ship-house (No. 5) to the blacksmith-shop was finished in 1824; it was 687 feet long, 10 feet high, and 2½ feet wide.

Nothing more was done to improve the yard, excepting to finish the mast- and spar-house (now No. 7) until 1826.

Capt. Crane was relieved by Capt. Charles G. Ridgeley, in March, 1825.

In the year 1825 the bridge leading to Kittery was built, and the commandant made propositions to the owners of the land adjoining the bridge to cut a road leading to the main highway of Kittery. The owners of the land objected to such a road, although the government offered to purchase their land for this purpose. Finding that nothing could be effected by negotiation, application was made to the selectmen of Kittery, with the assurance that the damages would be paid by the government. The road was then laid out by them according to the laws of the State, and became a townway. The damages were paid by the United States, and communication by road opened with Portsmouth in the summer of this year.

In 1826 activity was resumed, and much work in the way of improvement done. Orders were received to select a proper site for the building of suitable barracks on the island. All wooden buildings and sheds were demolished and removed, especially those in the vicinity of the ship-houses. The upper story of the mast-house was finished for a rigging-loft, and the blacksmith-shop enlarged by two additions being built to it. Work was being forwarded also on the 74-gun ship and the frigate in the ship-houses.

In November, 1826, Capt. J. O. Creighton relieved Capt. Ridgeley as commandant. In the spring of 1827 the foundation of four brick buildings for officers' quarters was commenced, and in the autumn following they were finished. In the summer of the same year a brick block was built for the accommodation of the warrant-officers, petty officers, and seamen. Three timber-sheds were also built, 200 feet long, 65 feet wide, and 15 feet to the eaves; the roofs were slated and supported by stone pillars 10 feet apart; they are Nos. 45, 46, and 48. The cost of these sheds was $9250 each. In March, 1827, the keel of the sloop-of-war "Concord" was laid at the little slip where the "Porpoise" was built. The leveling for the purpose of building the barracks was completed and the foundation laid; the spot selected for the barracks was the extreme northeast point of the island. In August, 1828, Capt. J. D. Henley relieved Capt. Creighton in command.

On the 24th of September, 1828, the sloop-of-war "Concord" was launched. On the 21st of November, 1828, the yard was visited by one of the most severe gales of wind ever known in the vicinity, and great damage was done to the roofs of the buildings and the timber-dock. During the years 1829–31 nothing of importance was done in improving the yard, except the building of a timber-shed at a cost of $9500, no appropriations having been made for improvements and repairs. In September, 1832, Capt. Henley was detached from the yard, and the 9th of October, Capt. W. M. Crane was again appointed commandant.

The winter of 1832–33 was one of unusual severity, and all work out-of-doors was in a great measure suspended until the month of April, when, in compliance with orders received from the Department, a brick dwelling was commenced, adjoining the quarters recently built. It was the original intention of the Department to build two dwellings in uniformity with those already built, but it was afterwards decided to build a large dwelling for one family. The building (now Quarters B) was finished in December of 1833, and cost $15,000.

In the year 1834 orders were received from the Department to build a third ship-house in the yard, and after some delay in selecting a site, the present one was chosen, and work was begun at once on the foundation and slip.

During this year many improvements were made in the yard, extensive repairs being made to the bridge leading to Kittery, which had fallen into decay during the past nine years; the timber-dock was enlarged to accommodate the amount of timber which was required yearly for building and repairing vessels. The quarters were completed and occupied by the officers, and the old building, which had been occupied by the lieutenant of the yard, was fitted up as a temporary hospital for the station.

In 1815 the ship-house had advanced so rapidly towards completion that preparations were made to build a ship in it. In 1838 this magnificent structure was entirely finished, the total cost being $71,000. The "Lexington" and "Congress" were both fitted for sea, and sailed from the yard in 1837.

The barracks of the ordinary were raised one story and made into dwellings for the warrant-officers, at a cost of $4000.

On the 14th of April, 1838, Mr. John Floyd, naval constructor of the yard, died, and he was succeeded by Mr. Samuel M. Pook, who reported in November of the same year. The new ship-house was now finished, and a small sloop was being built therein. On the 14th of June, 1839, the sloop-of-war "Preble" was

launched, having been completed in thirteen months from the laying of the keel, and when ready for sea her cost was $112,782. On the 2d of June, 1840, the sloop "Preble," Commander Breese, sailed from this station, bound for the coast of Labrador, and after making six cruises upon different stations, she was converted into a practice-ship for midshipmen, and afterwards sold.

For some time past a wharf was being built from the old ship-house to the eastward. The manner of building was by cob-work of timber filled in with stone as a foundation. On the 1st of August the entire fabric gave away, and was precipitated into the deep water.

About 100 feet of sea-wall was destroyed by this accident, and the Department at once decided that the services of a civil engineer were required at the yard to obviate any future accident of this nature; consequently, Mr. Calvin Brown was employed as engineer and draughtsman at a pay of $3 a day, and from this date the services of a civil engineer have never been dispensed with at this yard.

As soon as the "Preble" sloop-of-war had been launched from the new ship-house preparations were made to immediately build a frigate of the largest class, and in August, 1839, the keel of the "Congress" was laid, and on the 16th of August, 1841, she was launched.

The old "Congress" was launched from the adjoining island at noon, August 15, 1799. She was 190 feet long on the spar-deck, 50 feet beam, and 1700 tons burden. The cost of the old "Congress" was $197,246, and that of the new $399,088, over twice the cost of the former. Capt. Crane was relieved from the command of the yard in October, 1840, by Capt. John D. Sloat.

The former practice of masting vessels by erecting sheers on board being tedious and expensive, Capt. Sloat received permission to build a pair of permanent sheers, which he did, using the lower masts of the "Alabama," 74, for that purpose; when erected they cost $2240. The masts of the "Congress" frigate were the first put in with the new sheers.

A diving-bell was purchased for the use of the yard, and work immediately began by removing the *débris* of the fallen sea-wall, under the superintendence of the civil engineer of the yard.

Orders were received to build a first-class sloop at the yard, and as soon as the frigate "Congress" had been launched work began upon the "Saratoga," and continued without interruption until July, 1842, when she was completed, and upon the 26th of that month was launched.

The appropriation for the improvement of the yard for the year 1843 was $41,000, which allowed some work to be done on the walls and buildings. The sloop-of-war "Portsmouth" was built and launched this year; she was an exact counterpart of the "Saratoga," and built in the ship-house recently vacated by that vessel.

On the 2d of November, Capt. Sloat was relieved by Capt. George W. Storer as commandant of the yard.

The boat-house and landing-stage was built in 1844, at a cost of $1221.50, and work commenced in blasting away the ledge in the middle of the island; with this exception no other improvements were made on the yard until 1846.

November, 1846, Commodore Daniel Turner relieved Capt. Storer in command.

The attention of the Department had been attracted to the subject of a dry-dock at this yard, and a board of civil engineers, under Mr. Sanger, was ordered to examine the island for the purpose of locating the site. The subject was discussed in all its points, and the board finally decided that a floating dock would be much cheaper and better suited to the requirements of this yard than a stone dock, and reported its views to the bureau. A controversy then arose between the two inventors of floating docks. Messrs. Gilbert & Secor, the inventors of the floating balance-dock, claimed for their invention a superiority over that of the sectional-dock of Messrs. Moody & Dakin; the bureau was much embarrassed by these conflicting claims, and finally settled the controversy by building two of each at the different yards. Cisterns were built in different parts of the yard at a cost of $31,528.

In May of 1847 the keel of the steamer "Saranac" was laid in the new ship-house. Mr. Parris reported as civil engineer of the yard, retaining Mr. Brown as his assistant. In 1848 the work of leveling was carried on with vigor. The smithery was enlarged and rebuilt, and the sea-wall finished to the knee-dock. In November, 1848, the side-wheel steam-frigate "Saranac," the first steamer built at this yard, was launched. The powder-magazine, which had been commenced the year previous, was finished in 1849. Capt. Thomas W. Wyman relieved Commodore Turner as commandant on the 2d of November, 1849.

In 1851 a contract was entered into with Messrs. John S. Gilbert and Zeno Secor, of New York, to construct, with all the necessary machinery and appendages, a floating balance-dock and railway to the satisfaction of the superintending engineer. The test was made in June, 1852, and the works accepted.

Mr. Parris, the civil engineer, having died, B. F. Chandler, Esq., was appointed to fill the vacancy, and entered at once upon his duties. The site having been selected, a coffer-dam was constructed, within which the excavations were to be made for the foundations, floors, and walls of the dock-basin. The whole was to rest on a foundation of piles, 3000 of which were driven through the earth to solid rock. They were placed 3 feet from centre to centre and the interstices filled with clay; they were then cut off 12 feet below high-water mark, capped with timber, and the entire surface covered with 5-inch plank. Five courses of hammered granite in the direction of the length of the dock were laid of 1 foot rise, and a bed of concrete 6 inches thick between the stone bearings. The basin completed is 360 feet in length and 125 feet in width, with granite walls 14 feet high of large stone, hammered beds, builds, joints, and face, and laid in cement; at the outer end of the walls of the basin, and across the bottom in the stone-work, is a groove cut 2 inches wide and 6 inches deep to receive the keel and stems of a boat-gate, which, when in place, incloses the dock within the stone basin. The dock was constructed on the island opposite the navy-yard, called Pierce's Island, and when completed was floated across the river. The

length of the floating dock is 350 feet; breadth outside, 135 feet 4 inches, and walls 38 feet high. The walls or chambers on each side are 7 feet 8 inches wide, the entire length of the dock. On these walls and amidship of the dock is the machinery for working it while docking or undocking vessels. November 1, 1852, Capt. Wyman was relieved by Capt. Joseph Smoot. During this winter but little was done on the yard in the way of improvements. The new ship-house was lengthened 50 feet and the keel of the frigate "Franklin" laid therein, the old ship being under process of demolition. In the month of February, 1855, the frigate "Santee" was launched, having been in process of construction since 1820. The keel of a light-ship was laid in the ship-house soon after the launching of the "Santee," and in the summer of the same year she was launched.

Commodore John T. Newton relieved Capt. Smoot as commandant of the yard in October, 1855, and the remainder of this year was devoted to finishing up the work already begun, and in hurrying to completion the frigate "Franklin," now well under way.

In April, 1856, permission having been obtained from the Navy Department by the inhabitants of Seavey's Island, a bridge was built from the navy-yard across the narrow stream which separated it from that island; this bridge was of course to be subject to the discipline of the yard, but as may be readily seen, was the occasion of much annoyance to the yard authorities, as well as discomfort to the inhabitants of the island. In order to avoid theft from the government, persons carting private material through the yard were compelled to submit their loads to the inspection of the watchman; and at night, even packages carried by persons were subjected to examinations; the continued vexations attending this privilege of passing through the yard ultimately led to the purchase of the adjoining island by the government.

In July of 1857, Commodore J. T. Newton, while on a leave of absence, was smitten with paralysis, and after a few hours of great suffering expired.

Commander Charles W. Pickering, being senior officer present, assumed the command of the station until relieved by Capt. John Pope, on the 11th of August. During this year the fine building for offices and muster-room was finished and occupied, the entire cost of which was $28,633. The appropriation made in 1857 for this yard was $104,422, which admitted of many improvements being made that were much needed. The head-house was raised one story and a half, and fitted with machinery; the magazine buildings finished, a lodge built for the ordinary men of the yard at a cost of $4845, and iron fences substituted for the wooden ones around the quarters. The dry-dock was in use the greater part of the year, the "Vandalia," "Constitution," and sloop "Falmouth" having received repairs upon it; and during the year following the sloops "Portsmouth" and "Jamestown," having arrived from a cruise, were both docked and extensively repaired.

On the 1st of October, 1860, Capt. John Pope was relieved as commandant by Capt. G. F. Pierson.

The very threatening aspects which the political affairs of the country had assumed, caused the commandant to request permission to fortify the defenses of the harbor early in 1861.

On the 27th of April the commandant of the station received orders to put the yard on a war footing; fortify the earth-work on Seavey's Island with 8-inch guns; open a rendezvous in Portsmouth for recruiting men both for the navy and marine corps. He was also empowered to examine and appoint officers, subject to the approval of the Department. The "Santee" and "Sabine," frigates, "Marion" and "Dale," sloops-of-war, were fitted out and sailed on a cruise. War was now considered as declared with the Southern States that had seceded. All officers in command of ships of war were instructed to capture, sink, burn, or destroy vessels on the high seas hostile to the U. S. government, or having on board articles contraband of war. The keels of two steam sloops-of-war were laid, the "Kearsarge" and "Ossipee." The latter was launched in November, and the former in December. The steam-sloops "Sebago," "Mahaska," "Sacramento," "Sonoma," and "Connemaugh" were commenced in 1861. The two former were finished during the autumn, but the last two not until the spring of 1862. The yard was now worked to its full capacity, over 2000 men being employed. Additions were made to the ordnance-building, and the inspection building of provisions and clothing was also built, at a cost of $12,586.

During the years 1862–63 the following ships and gunboats were built, launched, and fitted for sea at this yard: "Sebago," "Sonoma," "Sacramento," "Connemaugh," "Mahaska," "Ossipee," and "Sassacus." The "Constellation," "Colorado," and "Minnesota" were also repaired and fitted for sea, and work during these two years had progressed upon the steam-frigate "Franklin" so as to insure her completion in a short time should she be needed. Several temporary sheds were erected about the yard to accommodate the different departments, which were now being crowded to their utmost extent with work.

During the year 1863 the gunboats "Patuxet," "Nipsic," and "Shawmut" were built, launched, and fitted for sea; and the frigate "St. Lawrence," bark "Fernandina," and steam-sloops "Alabama," "Dacotah," and "Agawam" were repaired and fitted for sea in addition to those already mentioned. On the 18th of November the keel of the ironclad "Passaconaway" was laid in ship-house No. 4. On the 4th of February the porter's lodge took fire and was entirely consumed in a short time, a heavy wind blowing from the northwest, and the mercury being 13 degrees below zero rendered all assistance impossible.

The year 1864 opened gloomily for the country; the war dragged along, and the yard still continued to teem with workmen and the wharves to be crowded with vessels. The sloop-of-war "Vandalia" had been ordered to this station for a guard as well as a receiving-ship. On the 23d day of January the ship-of-the-line "New Hampshire" was launched (she was the "Alabama," 74, whose keel was laid on the 15th of April, 1817), having been upon the stocks 47 years. She was fitted as a store-ship and sent to Port Royal, S. C.

During this year the "Colorado" was repaired, docked, and fitted for sea; 2 tugs built and launched,—the "Port Fire" and "Blue Light"; the ironclad "Agamenticus" launched and fitted for sea; "Iosco" taken into dock and repaired; "San Jacinto" repaired and fitted; the steam sloops-of-war "Piscataqua," "Minnetonka," and "Illinois" built; the frigate "Franklin" finished and launched, and the sloop "Contoocook" launched, also several of the small purchased vessels were docked and refitted. The boat- and carpenter-shop was built this year by contract, Messrs. Clement & Cressey doing the work. Numbers of vessels were now arriving at the yard from Southern ports, and many cases of yellow fever were discovered, which caused much alarm in this vicinity.

In July the "De Soto" arrived, and after remaining a short time in the lower harbor steamed up to the yard and was put out of commission. Immediately the fever broke out among the workmen on this ship, and in many cases proved fatal. The sail-loft was closed, the yard put in quarantine, and the ship removed to the lower harbor.

In October, Commodore T. Bailey relieved Commodore Peirson as commandant of the station.

In 1866 the adjoining island was purchased by the government for $105,000. This island contains about 105 acres, with an extensive water front; the stream separating the two can be filled in, and the area thus added will be sufficient for the requirements of the navy-yard for years to come. The wings of the office-building were raised and extended, a crane built, and a new steam fire-engine added to the fire department of the yard this year. October, 1867, Commodore Joseph Lanman relieved Commodore Bailey as commandant. Coal-sheds were erected on Seavey's Island and residences furnished upon that island for the naval constructor and civil engineer attached to the yard; an iron building erected for a boiler-shop for steam-engineering department at a cost of $15,000. The U. S. S. "Benicia" was finished and launched, and the steam-sloop "Monongahela" was taken upon the railway to be rebuilt, having been thrown ashore by the tidal-wave following the great earthquake at the island of St. Croix, West Indies, the year previous. During the year following, 1869, Commodore J. A. Winslow relieved Commodore Lanman.

The fire-engine house was also built this year at a cost of $8940, and the wings which were added by Commodore Howell several years after at an expense of $800, made the entire structure cost $9400. In July, 1870, Commodore A. M. Pennock relieved Admiral Winslow in command of the yard. But little improvement was made to the yard owing to the meagre appropriations for that purpose during 1870, 1871, and 1872. The "Narragansett" was fitted out, work was progressing on the "Monongahela," and the sloop "Illinois" was taken to pieces. On the 10th of October, 1872, Commodore John C. Howell relieved Admiral Pennock.

The appropriation for this yard having been increased, work was at once begun in the various departments of the yard. A chain-shed was built; the floating dock extensively repaired; a truss-bridge built to connect the yard with Seavey's Island; gas-pipes laid, gas-works built, and gas introduced for lighting the yard and quarters; wharf and bridge built on Seavey's Island; tool-house built and portico, etc., added to the commandant's quarters. In addition to these repairs and improvements, the beautiful waiting-house at the Portsmouth landing was built to take the place of the miserable shed which had been in use many years.

The "Monongahela" was rebuilt and refitted and the "Marion" steam-sloop launched. Two steam sloops-of-war were begun in 1873, and both launched the year following; the "Enterprise" being the first of these two sloops launched. She was built by contract by Mr. J. Griffiths, the government furnishing everything excepting labor. The sloop "Essex," the other of the two sloops constructed at the yard, was built entirely by the government. Much difficulty was experienced during the summer of 1874 in supplying the yard with fresh water, owing to the dryness of the season; in fact, it was the occasion of much anxiety, as the various workshops in the yard are dependent upon fresh water to fill their boilers. The fact was laid before the Department, and several propositions were made. One was to cover an artesian well on the island, the estimated cost of which did not fall short of $60,000, owing to the peculiar formation of the strata. By an accidental discovery of several springs upon Seavey's Island, it occurred to the commandant that a dam might be so constructed as to save the water that escaped and form a pond in the valley, which was already swampy. It was done at small cost, and in a short time a large pond was formed, which is now a never-failing source of supply, being conducted by pipes to a cistern in the yard. The entire cost of this work, including a steam-engine for pumping the water into the reservoir for distribution, was less than $500. This pond has never failed to supply the yard with water, and in the winter also with a large supply of heavy ice, which is stored for the use of the yard and the sick at quarantine: several hundred tons of this refreshing commodity is thus saved every year.

Kittery bridge, which for some time had been considered as unsafe, was extensively repaired and put in complete condition.

In October, 1874, Commodore Howell was ordered to Washington as chief of the Bureau of Yards and Docks, and he was relieved by Commodore Andrew Bryson, who was succeeded in 1876 by Commodore Jno. Guest. Commodore Guest died on January 12, 1879, while in command of the yard, and the present commandant, Commodore J. C. Beaumont, was ordered to the command.

Navy-yard, Washington, D. C. This yard was established in 1800, the ground on which it stands having been purchased for $4000. It is bounded by East Sixth and East Ninth Streets, M Street south, and the East Branch of the Potomac River. This area covers about 20 acres, and is inclosed by a substantial brick wall, having the principal entrance at the foot of Eighth Street, through a handsome arched gateway. The extensive workshops comprise foundries, forges, rolling-mill, and machine-shops. The grounds are beautifully laid out, and the officers of the yard have commodious residences within the walls. This yard is the principal ordnance depot of

the navy, and it contains a laboratory, where cartridges, signal-lights, etc., are manufactured. For years the navy has been supplied with anchors and cables from this yard, and since the new rolling-mill has been started it turns out all the chain and most of the round iron used by the navy. The first chain-cable manufactured by the navy was made at this yard in 1829, and from that date up to August, 1868, there had been manufactured 828 cables, besides hundreds of anchors and small chains. Very little ship-building or repairing has been done here, the frigate "Minnesota" being the largest and most important vessel built; she was launched in 1856. During the years of the Rebellion the Washington Navy-Yard was a scene of ceaseless activity; it was the headquarters of the Potomac Flotilla, and vessels from other stations were frequently sent to this station for repairs and supplies; the yard at that time proved of almost inestimable value to the government. It has been commanded by a long line of distinguished officers, among whom may be mentioned Commodores Aulick, Buchanan, Stevens, Radford, Poor, Patterson, and Febiger, and the late Rear-Admiral Dahlgren was for many years stationed at this yard as ordnance-officer, and at the outbreak of the Rebellion in 1861, Capt. Dahlgren and Lieut. Russell were the only officers then stationed here who remained loyal, all others from the commandant down resigning and joining the Confederacy. Capt. Dahlgren commanded the navy-yard from 1861 to 1863, and again from 1866 to 1868.

Neap Tides (Sax. *neafte*, scarcity). The smallest tides; they take place after the first and third quarters of the moon, when the sun and moon do not act in the same line. See TIDE.

NEAPED, or BE-NEAPED. The situation of a ship left aground on the spring-tides so she cannot be floated off until the occurrence of the next spring-tides.

Near. *Near* and *no near* are terms sometimes used for *no higher*. See HELM.

Nebular Hypothesis. Although Laplace is generally considered the originator of this hypothesis, it is not strictly true. Kant, a few years before, had in point of fact announced this theory, but Laplace was the first to bring it to general notice. He supposed the atmosphere of the sun to have filled the whole space now occupied by the solar system, and to have existed as a vast revolving nebulous mass, which, gradually cooling and contracting, threw off, in accordance with mechanical and physical laws, successive rings of matter, from which, in obedience to the same laws, were produced the planets and satellites. He was led to this theory from the uniformity of direction in the movements of the planets.

This hypothesis has given rise to much discussion. Many advocates of it have contended that it fully satisfies the present condition of affairs. Prof. Ennis undertook to prove that gravity and contraction acting on a nebulous mass would cause a rotation about an axis, and thus start the mass in motion, so that it would necessarily throw off the planetary rings. Others have shown the weak points in the hypothesis so conclusively, that a modification of it is now generally conceded necessary in order to cause it to be generally accepted.

The writer has advanced the idea that repulsion was a force overlooked in this theory of cosmogony. If gravity attracts masses to the sun, there must be another force, and by analogy we would expect it to be differently developed, which expends energy in repelling bodies from the sun. Gravity acts directly between the bodies attracted and the sun. Repulsion acts from the sun in every direction, being diffused as the light of a lamp; it is given off by all bodies, now cooling and contracting in every direction, its intensity being, like gravity, inversely as the square of the distance. A body is attracted to the sun according to its weight; it is repelled according to its size. There is nothing in this idea that conflicts with Newton's law of universal gravitation, for the difference between these two forces would satisfy his law. Repulsion and centrifugal force acting together exactly balance the force of attraction. Such a force as this would give permanence to the places and orbits of the planets; for, were they disturbed by a comet or other body, they would naturally return to that distance from the sun where the forces exactly counterbalance.

The force of gravity, exactly balanced by centrifugal force, is an unstable equilibrium; but the supposition of a third force makes a stable equilibrium.

If we suppose all other suns to have a repulsive force, all nebulous matter would be driven to the confines of the systems; there it would reach a place of comparative rest, its attraction towards the systems counterbalancing the repulsive force of all the repelling bodies. This mass would now commence to contract, the power of gravity as it contracts would cause it to move towards the systems; as it approached the heavenly systems the force of repulsion would increase rapidly, and consequently the mass would begin to change its course, avoiding the centre of attraction and repulsion; owing to the resistance met the centre of gravity would be in advance of the centre of figure, and a motion of rotation must necessarily ensue. We now have the nebular mass in the condition required by the hypothesis of Laplace.

This force of repulsion would also regulate the throwing off of the planetary rings. When the planets formed and moved in their orbits about the sun, the centre of weight would be in advance of the centre of figure, repulsion would then cause a rotation on an axis approximately perpendicular to the plane of their orbits and from west to east.

But repulsion has also an important part to act in the gradual dissipation of the system back to nebulous matter; it is illogical to advocate any explanation of the growth of any system or systems without indicating the way for its decay and return to its original condition. Everything we see in nature follows the general law of reproduction, and it is an acknowledged fact that the same laws prevail in the greatest as in the least of the processes of nature.

I take it for granted that there is a medium in space for the transmission of heat and light, and that it necessarily offers some resistance, no matter how slight, to the heavenly bodies. This resistance causes the greater part of the atmosphere of a planet to follow it, and thus causes the centre of attraction to be ahead of the centre of figure,

the two forces acting at these points in different directions causes diurnal motion. The resistance of the ether of space would cause the planets to gradually stop in their orbits were it not for the slight increase of orbital motion caused by diurnal motion. This increase exactly counterbalances the retardation of orbital motion caused by the ether of space.

Now, it is apparent that if such is the case, upon a planet becoming solidified in its old age its atmosphere would disappear, and consequently diurnal rotation would cease, and orbital motion itself would gradually come to an end. As there is no loss of motion possible, both these motions would be converted into molecular motion, and disruption would occur just as sure as it would occur if the earth were suddenly stopped in its orbital and diurnal motions. The various pieces would follow erratic orbits, and sooner or later fall to the sun only to be repulsed again, and thus, by slow attrition, reach the nebulous condition.

Comets, meteors, and systems of meteors have a tendency to fall to the sun, and are repelled again, each time suffering some dissipation from his heat. They are thus gradually converted into nebulous gas, and driven to the confines of the systems, where they go towards forming a new system.

The sun would, according to the same laws, finally suffer disruption. He would continue to be attracted and repelled by the united efforts of all other suns, and would, in time, suffer the fate of his own planets. The same matter would not again, as a whole, form a new system any more than an old tree furnishes all the matter for its successor.

The nebular hypothesis has been generally advocated by evolutionists, who have used it as an argument in opposition to the belief of a miraculous creation by the Almighty.

But it is evident that if worlds and systems of worlds come into existence according to law, to run the natural course of growth and decay, it requires a law-giver, just as a miraculous creation requires a creator.—*R. M. G. Brown, Lieutenant U.S.N.*

Necessity. If a ship be compelled by necessity to change the order of the places to which she is insured, it is not deemed deviation, and the underwriters are still liable.

Necklace. Formerly, a chain around the lower mast to which the futtock-shrouds were secured. Also, a strap around a mast, carrying leading-blocks.

Neckur. A Scandinavian sea-sprite, whence some derive our "Old Nick" in preference to St. Nicholas, the modern patron of sailors.

Needle. The magnetized bar of steel in the mariner's compass; the form used by the Chinese was like a needle, being a light thin wire. It is now a regular parallelopiped with the narrow dimension placed vertically. See COMPASS, THE MARINER'S.

Needle-fish. The shorter pipe-fish, stang, or sting, *Sygnathus acus.*

Needle-gun (Germ. *Zündnadelgewehr*). A breech-loading fire-arm having a needle or pin traversing the breech-block, which, upon being struck by the hammer, is driven into the fulminate, igniting it and exploding the cartridge. The needle-gun was invented by Nicholaus Dreyse, and, until superseded by the Mauser gun, it was the regulation weapon of the German infantry. Its efficiency has been demonstrated in all the German wars since 1848. It is clumsy and complicated, but excellent for precision and rapidity of discharge.

Negligence. If an agent or broker engages to do an act for another, and he either wholly neglects it, or does it unskillfully, an action on the case will lie against him.

Nelly. *Diomedea spadicea*, a sea-bird of the family *Procellaridæ*, which follows in the wake of a ship when rounding the Cape of Good Hope.

Nelson, Horatio, Lord, was born on the 29th of September, 1758, at Burnham Thorpe, Norfolk. It would be impossible to find a name in the naval annals of the whole world more justly celebrated for skill, valor, and success than that of the British sailor "Nelson and Bronte." He served a long apprenticeship to the ordinary duties of a naval officer before he had an opportunity of making a reputation. Begining his career in the Arctic Seas, and serving afterwards in the West Indies, the coast of Mexico, and of Canada, always commanding respect for his steady perseverance, his intelligence, and intrepidity, he obtained a command in January, 1793, and soon earned fame in independent action. Ordered to the Mediterranean to protect the interests of Italy and England against the assaults of the French revolutionists, he joined the "Corsican Paoli," and besieged Bastia. Never resting while an enemy was to be met, he boarded and captured several French and Spanish men-of-war. In 1797 he was appointed to join Sir John Jervis in the "Captain," 74, and on board that vessel took part in the victory off Cape St. Vincent, which secured for Jervis his elevation to the peerage. The service which Nelson rendered in boarding two Spanish ships raised him to the rank of rear-admiral, added to which were the insignia of the Bath and a gold medal. In an operation against Santa Cruz, Admiral Sir Horatio Nelson lost his right arm. In 1798 he was sent in pursuit of a powerful French fleet then covering the operations of a French army under Napoleon in Egypt. Finding the fleet at anchor in Aboukir Bay, near Alexandria, Sir Horatio immediately delivered battle. A tremendous conflict ensued, which terminated in the complete annihilation of the French armament. This action is known in English history as the "Battle of the Nile."

Denmark, Sweden, and Russia having combined to place limits to the naval power of England, Admiral Sir Hyde Parker was dispatched to the North Sea to crush the confederacy. Nelson hoisted his flag in the "Elephant," and led the way to the Baltic. Meeting the combined fleet, the English gave them battle, and the upshot was the complete destruction of the hostile alliance. For this exploit Nelson was raised to the dignity of a viscount, and placed in command of the fleet in the North Sea. Campbell, the poet, has immortalized the "Battle of the Baltic."

Napoleon Bonaparte, intending to invade England, had assembled a large military force at Boulogne, and only awaited the arrival of a powerful fleet to convoy the troops across the Channel. Aware of this fact, Lord Nelson, with a

squadron, went in search of the French ships to prevent their approach to Boulogne. Failing to find the fleet in the West Indies he recrossed the Atlantic, and came up with the object of his search off Cape Trafalgar, near the entrance to the Strait of Gibraltar. He patiently awaited them at the mouth of Trafalgar Bay, and when the fleet emerged from its retreat under Admiral Villeneuve, he gave it battle on the morning of the 21st of October, 1805. The two forces were of equal strength, but the form of attack adopted by Nelson gave the British so great an advantage that, after a fight of many hours' duration, the French struck their colors. Nelson's ship was the "Victory," and he stood on the quarter-deck during the whole of the engagement. Wearing all his stars and other decorative insignia, he was a conspicuous mark for the riflemen, and by one of them in the mizzen-top of a French man-of-war he was shot dead. Mourned by the whole British nation he was decreed a pompous funeral, and his remains lie in the crypt of the Cathedral of St. Paul's.

Neptune. The place of this planet was computed by Le Verrier and Adams in 1845–46, from the known perturbations of Uranus. It was first seen at Berlin, September 23, 1846, only 52′ from its place as determined by Le Verrier from his computations. Mean distance from the sun, 2860 millions of miles; period of revolution, 165 years; diameter, 40,000 miles; apparent diameter, 3″; symbol ♆, a trident.

Neptune. The god of the sea. See SEA-GODS.

NEPTUNE'S GOBLETS. The large cup-shaped sponges found in the Eastern seas,—*Raphyrus patera.*

NEPTUNE'S SHEEP. Waves breaking into foam, called white horses.

Nest. See CROW'S NEST.

Netting. A net-work of small lines used for various purposes. See BOARDING, HAMMOCK, SPLINTER.

Nettle. Two or three yarns laid up by hand; used for hammock-clews and neat seizings. *To nettle*, to provoke.

Neutral. A state that takes no part in a war between other states. See INTERNATIONAL LAW.

Newark is a port of entry and city of New Jersey, in Essex County, on the Passaic River, 4 miles from Newark Bay. Lat. 40° 45′ N.; lon. 74° 10′ W. Pop. 136,983. It is the largest city in the State, and its rapid growth is due to its extensive manufactories, the principal of which are carriages, beer, machinery, castings, jewelry, shoes, harness, and clothing. The commerce is principally confined to the coast trade, which is very large and important.

New Bedford, Mass., is situated in Bristol County, near the mouth of the Acushnet River, in lat. 41° 38′ N., lon. 70° 56′ W. The river forms a commodious harbor, which at Clark's Point is defended by a strong fortification of granite. This town has been more largely engaged than any other town in the world in the whale-fisheries, employing at one time 400 vessels, which has now declined to a fleet of 125. Since the decline of its whale-fisheries the town has become a manufacturing city, the Wamsutta and Potemska cotton-mills, flouring-mills, and various other manufactories having located here. Pop. about 26,000.

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Newburyport is situated on the Merrimac River, 3 miles from the ocean, in Essex County, Mass., in lat. 42° 48′ 32″ N., lon. 70° 52′ 47″ W. It contains a custom-house, marine museum, has extensive manufactures of cotton goods, machinery, and boots and shoes; ship-building is also carried on. The harbor is safe and spacious, but is obstructed at the entrance by a sand-bar. Pop. 13,500.

Newcastle-upon-Tyne. A city and port of England, in Northumberland County, on the left bank of the Tyne, 8 miles from its mouth. The manufactures are very extensive, and within the city and its immediate vicinity are numerous blast-furnaces, malleable and other iron-works. Iron goods, fire-arms, ordnance, bronze goods, hardware, etc., are among the principal articles of manufacture. There are also extensive saw-mills and ship-building yards, at which large numbers of sailing-vessels and steamers are constructed. The import and export trade are very important. Pop. 128,500.

Newcome. An officer commencing his career. Any stranger or fresh hand newly arrived.

Newell. An upright piece of timber which receives the tenons of the rails that lead from the breastwork of the gangway in old-style ships.

New Haven, a port of entry and the county-seat of New Haven County, and the largest city in Connecticut, is situated at the head of New Haven Bay, 4 miles from Long Island Sound, in lat. 41° 18′ 23″ N., lon. 72° 56′ 30″ W. It is quite an extensive business centre, having a large inland and coastwise commerce, also a considerable foreign trade, carried on both direct and through New York, the exports in 1879 amounting to $2,362,385, comprising nails, starch, breadstuffs, and fire-arms, and the imports, mostly sugar, molasses, iron, steel, etc., amounted to $788,181. A vast quantity of fire-arms and cartridges are manufactured here by the Winchester and other arms companies. Pop. 63,000.

New London, a port of entry and city of New London County, Conn., is situated on the river Thames, 3 miles from the ocean, in lat. 41° 22′ N., lon. 72° 9′ W. The harbor is one of the best in the United States, is 3 miles long, with 30 feet depth of water. Above the city, on the east side of the river, is the U. S. Navy-Yard, and below the city are Forts Trumbull and Griswold. The citizens own numerous vessels engaged in the seal, whale, and other fisheries, and the city also contains manufactories of sewing-silk, mowing-machines, cotton-gins, machinery, etc. Pop. 10,000. See NAVAL STATION.

New Moon. See MOON.

New Orleans, La., is the commercial metropolis of the Gulf States. It is situated on the Mississippi River, about 100 miles above its delta, in lat. 29° 58′ N., lon. 90° 5′ W. As a port of entry it includes, besides its own port, those of Pittsburgh, Pa., Wheeling, W. Va., Louisville, Ky., Nashville and Memphis, Tenn., Cincinnati, O., St. Louis, Mo., Evansville, Ind., Galena and Cairo, Ill., Omaha, Neb., La Crosse, Wis., Burlington and Dubuque, Iowa. New Orleans is the great cotton market of the country, and it is the grand centre of commerce of the entire Mississippi Valley. The value of its exports in 1879 amounted to $81,105,822, and its imports, $8,259,606. The jetties in the river at Port Eads, below the city, now give 30 feet of

water over the bar at the mouth of the river, and the commerce is rapidly increasing. Pop. 207,000.

Newport, Christopher, Captain, commanding an expedition authorized by James I. to carry emigrants to Virginia, sailed with 3 ships, of not more than 100 tons burden each, on December 19, 1606. Roanoke was the objective-point, but a violent storm drove the expedition to the north of its destination, which was so far fortunate that it enabled Capt. Newport, after sighting and naming Cape Henry and Cape Charles, to enter Chesapeake Bay. Thence he entered the Powhatan, to which he gave the name of the James River. He thus became a discoverer, by accident, of localities of great importance and interest. Out of this discovery arose Jamestown, the first city of English origin ever established in America.

Newport, R. I., is a port of entry and fashionable watering-place, situated on Narragansett Bay, in lat. 41° 29′ N., lon. 71° 19′ 12″ W. It has a good harbor, deep enough to float the largest ships, which is defended by Fort Adams, a granite fortress, which mounts 468 guns. The magnificent steamboats plying between New York and Fall River touch at Newport every day. The Torpedo School of Instruction of the U. S. navy is situated on Goat Island, immediately opposite the city, and about ½ mile distant. The city contains manufactures of cotton goods, brass, copper, flour, fish, oil, etc. Its commerce was ruined by the war of independence, which also nearly depopulated the town, and it has never recovered its commercial importance. Pop. about 15,000.

News (*Eng.*). *Do you hear the news?* A formula used in turning up the relief watch.

New York, the most populous and important city of the western hemisphere, and the commercial metropolis of the nation, is situated chiefly upon Manhattan Island, which is 13½ miles long on the Hudson River side and 8 miles long on the East River side, separated from the mainland by the Harlem River and Spuyten Duyvil Creek. Lat. of city hall, 40° 42′ 43″ N.; lon. 74° 0′ 3″ W. The city includes also the islands in the bay (Ellis, Bedloe's, and Governor's), and Ward's, Randall's, and Blackwell's in the East River. The southern end of the island is occupied by vast wholesale and importing warehouses, the retail trade lying north of Fourteenth Street. The headquarters of the military division of the Atlantic are situated on Governor's Island, and the other islands of the bay and East River are nearly all occupied by fortifications, magazines, etc. The entrance to the harbor, called the Narrows, is defended by Fort Wadsworth on Staten Island and Fort Hamilton on Long Island, and in the bay and East River are situated Forts Columbus, Wood, and Schuyler. The Treasury Department reports show that for 20 years, from 1859 to 1879, about 56 per cent. of all the exports, and about 65 per cent. of all the imports, of the United States were sent and received through the port of New York; 73 per cent. of the bullion and coin exported went from New York, about 70 per cent. of the duties was collected here, and more than 50 per cent. of the aggregate tonnage of the United States was registered in this city. The tonnage of vessels registered in 1879 was 24,155,157 tons, the value of imports for that year was $1,718,695,720, and the exports $1,678,328,316. The domestic trade is also immense, largely exceeding the foreign. The manufactures are very extensive, comprising all varieties of textile fabrics, machinery, musical instruments, ales, beers, cordage, and sails; vessels and steamships of all kinds are also built and repaired here; foundries and blast-furnaces for the manufacture of all kinds of castings and machinery are principally located along the East and Hudson Rivers and their immediate vicinity. Manhattan Island was discovered in 1609 by Henry Hudson, an English navigator employed by the Dutch East India Company. Settled by the Dutch in 1612, it surrendered to the English in 1664; it was retaken by the Dutch in 1673, and held by them for one year only. In 1783 it was evacuated after a long possession by the British troops. Its population in 1790 was 33,131; its present population, by the census of 1880, is 1,209,561.

Nib-block. A metal block having a rigid hook which causes the block to stand square.

Nichols, Edward T., Rear-Admiral U.S.N. Born in Georgia, March 1, 1823. Appointed from Georgia, December 14, 1836; attached to sloop "Levant," West India Squadron, 1837–40; Naval School, Philadelphia, 1841–42.

Promoted to passed midshipman, July 1, 1842; frigate "Columbus," Mediterranean Squadron, 1842–44; steamer "Colonel Harney," Atlantic coast, 1845; frigate "Columbia," Brazil Squadron, 1845–47; bomb-vessel "Stromboli," Home Squadron, 1847–48; frigate "Savannah," Pacific Squadron, 1849–51.

Commissioned as lieutenant, March 13, 1850; navy-yard, Pensacola, 1852–53; steam-frigate "Saranac," Mediterranean Squadron, 1853–56; navy-yard, Portsmouth, N. H., 1857–58; sloop "Jamestown," Home Squadron, 1858–60; commanding steamer "Winona," West Gulf Blockading Squadron, 1861–62; bombardment of Forts Jackson and St. Philip; present at and received the surrender of Fort St. Philip, April 28, 1862; attack upon and passage of Vicksburg batteries, June 28, 1862; engagement with rebel ram "Arkansas"; bombardment and passage of Vicksburg batteries, July 15, 1862.

Commissioned as commander, July 16, 1862; commanding steamer "Alabama," West India Squadron, 1863; commanding steamer "Mendota," North Atlantic Blockading Squadron, 1864–65; engaged with rebel battery at Four-Mile Creek, James River, June 16, 1864; special duty, New York, 1866–68.

Commissioned as captain, July 25, 1866; chief of staff, Asiatic Squadron, 1870–72.

Commissioned as commodore, May 24, 1872; commandant navy-yard, Boston, 1872–76; member of Board of Examiners, 1877.

Commissioned as rear-admiral, February 25, 1878; commanding South Atlantic Station, 1878–80; light-house inspector since June 30, 1880.

Nicholson, Captain James, was born in Chestertown, Md., in 1737. He was first appointed to the "Virginia," 28 guns. She was lost in the Chesapeake Bay in the year 1778. An inquiry was instituted by Congress 18th April, but the result attached no degree of censure to Capt. Nicholson. On the 2d of June, 1780, in command of the "Trumbull," 28 guns, he had an action

with the "Watt," a letter of marque, supposed to be fully a match for one of our heaviest frigates. She was greatly superior in guns and in number of men to the "Trumbull." The action was within pistol-shot, and being maintained with great gallantry on both sides, it lasted, it is said, nearly 3 hours, when Capt. Nicholson having lost his main- and mizzen-masts, and the foremast being badly wounded, was reluctantly constrained to discontinue the contest, an event which it is presumed was not displeasing to the commander of the "Watt," whose loss has been stated at 90 men killed and wounded. The "Trumbull's" loss (29) in killed and wounded was less than one-third of that number. On the 8th August, 1781, the "Trumbull," with a very reduced crew, estimated at 180 men only, sailed from the Delaware. She had scarcely cleared the capes when 3 enemy's ships were descried in the east. The "Trumbull's" fore-topmast and main-topgallant-mast having been carried away, she could steer only directly before the wind. She had not cleared away the wreck of her fore-topmast, when one of the ships, the British frigate "Iris," came alongside, the other two being in sight. An action was commenced with the "Iris," and was continued for more than an hour, and rather to the advantage of the "Trumbull," when another of the ships (a frigate also) came up and fired into her. A contest against such odds could not be maintained with any prospect of success, neither could Capt. Nicholson escape, his vessel being a perfect wreck, not having a mast standing. The colors were therefore struck. Alexander Murray, who had recently been appointed a lieutenant in the navy by Congress, was a volunteer on board the "Trumbull," and displayed great gallantry in the action. Nicholson died in New York City, Sept. 2, 1804.

Nicholson, J. W. A., Commodore U.S.N. Born in Massachusetts. Appointed from New York, February 10, 1838; attached to sloops "Natchez" and "Warren," West India Squadron, 1838–41; to "Brandywine," frigate, Mediterranean Squadron, 1841–42; special service, 1842–43.

Promoted to passed midshipman, June 20, 1844; steamship "Princeton," 1844–46; Pacific Squadron, 1846–47; store-ship "Fredonia," 1848; frigate "Raritan," 1849–50; "Southampton," store-ship, Pacific, 1851–52.

Promoted to lieutenant, April 24, 1852; sloop "Vandalia," Japanese Expedition, under Commodore Perry, 1853–55; participated in all of the official meetings with the Japanese on that expedition; stationed on shore, with a guard from the "Vandalia," at Shanghai, China, for several months, to protect the foreign settlement, while the contending Chinese were encamped near by; navy-yard, New York, 1856–57; sloop "Vincennes," African coast, 1857–60; 1861, attached to steamer "Pocahontas," which vessel started for the relief of Fort Sumter, but arrived too late, as the fort capitulated, a short time after the arrival of the "Pocahontas," on April 13, 1861; stationed in Potomac River until October, 1861; engagement with rebel batteries at Acquia Creek; in command of steamer "Isaac Smith," 1861, and participated in actions with rebel fleet, November 5 and 6, and battle of Port Royal, November 7, 1861; also participated in the capture of Jacksonville, Fernandina, and St. Augustine, Fla.; held the towns of Jacksonville and St. Augustine for several months; while in command of St. John's River, was attacked by rebel infantry, and defeated them with considerable loss; engagement with rebel flotilla in Savannah River, February, 1862.

Commissioned as commander, July 16, 1862; ordnance duty, New York, 1863; South Atlantic Blockading Squadron, 1864; command of monitor "Manhattan," Western Gulf Squadron, 1864; battle of Mobile Bay forts, and capture of rebel ram "Tennessee," August 5, 1864; bombarding Fort Morgan from August 9 until the surrender on the 21st; commanding the steamer "Mohongo," Pacific Squadron, 1865–66; commanding steamship "Wampanoag," 1867–68.

Commissioned as captain, July 25, 1866; navy-yard, New York, 1868–70; commanding "Lancaster" (second-rate), South Atlantic Fleet, 1871–72.

Commissioned as commodore, November 8, 1873; member Board of Examiners, 1873–74; president Board of Examiners, 1875–76; commandant, navy-yard, New York, 1876–80.

Nidget. A coward. A term used in old times for those who refused to join the royal standard.

Nigger. A hoisting-engine in river steamers.

Nigger-head. An inferior quality of hard-rolled tobacco.

Night-cap. Hot grog taken just before turning in.

Night Order-book. A memorandum in which the commanding officer writes his orders concerning the management of the ship during the night.

Nilometer. An instrument for measuring the height of the water in the Nile.

Nimbus. The rain-cloud. See CLOUD.

Nine-pin Block. A swivel-block shaped somewhat like a nine-pin, and formerly used as a fair-leader under the fife-rail.

Ning-Po is one of the open ports of China, situated on the Ning-Po River, in the province of Che-Kiang, in lat. 29° 51′ N., lon. 121° 32′ E. It has a large manufacture of silks, cottons, woolens, etc., and many junks are built here. It exports large quantities of wood and charcoal. Pop. about 200,000.

Nip. A jamming together of two fields of ice. A sharp turn in a rope. *To freshen the nip.* See FRESHEN.

Nipcheese. A sailor's name for the purser's steward.

Nipper. A short bit of soft rope used in binding the chain to the messenger in heaving up the anchor; it is put on close to the manger and taken off when it arrives near the deck pipe. With chain-cables and chain-messengers iron nippers are used; they consist of a hinged clamp having an iron ring, which is slipped over the end when the nipper is put on; when the nipper is to be taken off the ring is knocked off with a hammer. Nippers are now out of date, the chain being taken directly to the capstan.

NIPPER-MEN. Fore and main topmen who passed and took the nippers in heaving up anchor.

Nitre, or Saltpetre. The nitrate of potassium (KNO_3). It is spontaneously generated in the soil and crystallizes upon its surface in several parts of the world, especially in India. It is also

produced artificially by imitating the conditions of its natural production. The most essential of those conditions seems to be the presence of decaying organic matter, whose nitrogen is oxidized by the action of the atmosphere into nitric acid, which combines with the bases (potash and lime) contained in the soil. The method consists in forming upon a flooring of clay heaps of animal matters mingled with ashes and lime-rubbish, the heaps being exposed to the air but protected from rain, and at intervals moistened with urine or stable-runnings. In these heaps nitrate of lime is slowly formed, which is extracted by lixiviation, and carbonate of potash added to the solution, which, by double decomposition, gives rise to the formation of nitrate of potash and carbonate of lime; the latter is precipitated, the former remains in solution, and is obtained in crystals by evaporation. Nitre crystallizes in six-sided prisms, soluble in seven parts of cold water, and in less than its weight of boiling water. It has a cooling saline taste, and is anhydrous. At about 660° it fuses, and at a red heat is decomposed. Its most important use is in the manufacture of gunpowder, and it is also extensively employed in the manufacture of sulphuric acid, in the preparation of nitric acid, as an oxidizing agent in numerous chemical processes, as an ingredient in fire-works, and as a medicine.

Noah's Ark. Certain clouds, elliptically parted, considered a sign of fine weather after rain.

Nock. The forward upper corner of a trysail or spanker.

Nocturnal Arc. That part of a circle which is described by a celestial object, between its setting and rising.

Noddy. The *Sternia solida*, a darb web-footed sea-bird, common about the West Indies.

Node. One of the two opposite points in which the orbit of a planet or comet cuts the ecliptic, or in which the orbit of a satellite cuts that of its primary. When the body passes from north to south this point is called the *descending node;* the opposite point is the *ascending node.* The line joining the two points is called the *line of nodes;* in the case of the moon it moves backward slowly, completing its revolution in 18.6 years.

Nog. A treenail which projects from the bottom of a wooden ship, while in the course of building, as a stop to the heads of the shores; also, a treenail driven through the shores to secure them.

No Higher. See HELM.

No-man's Land. Any space, the cleaning, painting, etc., of which are neglected because it does not fall exclusively within the limits of the space assigned to any man or set of men.

Non-combatants. A term applied to the officers not of the line, as their duties do not require them actually to fight the guns nor manœuvre the ship.

Non-condensing Engine. An engine in which the exhaust steam is not condensed, but escapes into the atmosphere; formerly termed a *low-pressure engine.*

Nonius Scale. See VERNIER.

No! No! The answer to the night-hail, by which it is known that a midshipman or warrant-officer is in the boat hailed.

Nook-shotten. A Shakspearian expression for a coast indented with bays.

Noon (*Sax.*). According to the time reckoned by, noon is the instant the point of definition is on the meridian. When the centre of the sun is on the meridian, it is *apparent* noon; when the mean sun is on the meridian, it is *mean* noon; when the first point of Aries comes to the meridian, it is *sidereal* noon.

Noose. A running knot.

Nordenskjold, Professor. A Danish explorer of the Arctic Seas. Skirting the outer coast of the Scandinavian peninsula, he passed to the north of Europe and Asia, rounding the northernmost cape of the latter continent, and, after a winter in the ice, entered the Pacific Ocean. Thence he sailed along the eastern and southern coasts of Asia into the Persian Gulf, passed through the Red Sea, the Suez Canal, and the Mediterranean into the Atlantic. This was accomplished between 1878 and 1880, and is consequently the latest exploration in the northern direction.

Norfolk, Va., a port of entry, is situated in Norfolk County, on the Elizabeth River, 8 miles from Hampton Roads, in lat. 36° 51′ N., lon. 76° 19′ W. It is the most populous city in the State except Richmond, and has a larger foreign commerce than any other city in the State, and, together with Portsmouth (directly opposite), is the most important naval station in the United States. The harbor is large, safe, and easily accessible, admitting vessels of the largest size to the wharves. The entrance to the harbor is defended by Forts Monroe and Calhoun. The exports are principally cotton, oysters, fruits, and vegetables. Pop. about 25,000. See NAVY-YARD (GOSPORT), NORFOLK.

Norland. Of, or belonging to, the north land.

Norma. See CONSTELLATION.

Norman. A short, heavy iron pin inserted in the bitts to prevent the cable from flying off in rapid veering.

North (Ang.-Sax. *nord*). The initial point of the compass.

Northern Diver. The *Colymbus glacialis*, a large diving-bird.

Northern-glance. The old sea-name of the *Aurora borealis.*

Northern Lights. See AURORA BOREALIS.

Northers. Those winds so well known to all seamen who have frequented the West Indies, and which are preceded by the appearance of a vast quantity of fine cobwebs or gossamer in the atmosphere, which clings to all parts of a vessel's rigging, thus serving as a warning of an approaching gale. Northers alternate with the seasons in the Gulf of Mexico, the Florida Channel, Jamaica, Cuba, etc.

Northing. The distance in nautical miles which a ship makes to the northward; it is the difference of latitude in sailing north.

Norway Skiff. A particularly light and buoyant boat, which is both swift and safe in the worst weather.

Nose. A term often used to denote the stem of a ship.

Notch-block. A name for a snatch-block.

Nothing off! See HELM.

Nowel. The core of a heavy casting.

Nozzle. A term sometimes applied to the exhaust-pipe of a steam-engine, but more properly to the adjustable end of an exhaust-pipe

when led into the smoke-pipe to utilize the exhaust steam to increase draft.

Nuddee. A Hindoostanee word for a river.

Nuggar. A term in the East Indies for a fort, and also for an alligator.

Number. *Ship's number*, the number given on the paymaster's book to each person on board; it remains unchanged throughout the cruise. *Watch-numbers*, or *hammock-numbers*, are changed as a man's station is changed. In the signal-book each vessel is denoted by a special number, which the ship hoists on falling in with another vessel in the navy. *Your number is made*, a phrase signifying that the person addressed has been sent for. *To lose the number of the mess*, to die.

Numeral. *Numeral signal*, a hoist of signals, expressing numbers, and not requiring reference to the signal-book. It is distinguished by the *numeral pennant* over it.

Nun-buoy. See BUOY.

Nurse, or Wet-nurse. A name given to an experienced first lieutenant sent in the ship with an incompetent commanding officer. Thanks to our system of promotion by seniority, this state of affairs is never to be met with in our service.

Nutation. A gyratory motion of the earth's axis, producing a periodical fluctuation of the apparent obliquity of the ecliptic, and of the velocity of the regression of the equinoctial points.

O.

O. In the log-book, *o* denotes *overcast*.

Oakum. Junk untwisted and picked to pieces; it is used principally in calking seams. *White oakum* is made from untarred rope.

OAKUM-BOY. A calker's apprentice.

Oar. An oar consists of the *blade* and the *loom*. The blade is the flat part which is dipped in the water in rowing; the loom is the inboard part, the inner extremity of which is called the handle. *To toss oars*, to throw them up perpendicularly. *To boat the oars*, to lay them in their places in the boat. *Oars!* the order to lay on oars. *To lay on oars*, to cease pulling and keep the oars parallel with the water. *To feather an oar*, see FEATHER. *To trail oars*, to throw them out of the rowlocks and permit them to trail alongside.

OAR-LOCK. A rowlock (which see).

OAR-PROPELLER. A form of propeller which is made by machinery to imitate the action of an oar in sculling.

Oaths. An oath, in a legal or judicial sense, is a solemn asseveration, made in the presence of a magistrate or authorized officer, whereby an individual binds himself by the highest obligation to observe certain conditions, or to testify to certain facts which he knows of his own knowledge. It is usually accompanied by an appeal to a Supreme Being for the truth and sincerity of what is declared or affirmed. Men in military and naval service have from time immemorial been accustomed to take oaths of fidelity, which among the ancients were administered with much greater solemnity than now. Kennett, in his "Roman Antiquities," p. 188, describes the impressive manner in which a Roman legion was sworn, each man repeating the oath as he passed by, crying, "*Idem in me.*"

The statutes of the United States are specific in providing the text or substance of all oaths, and minute in prescribing by whom and at what time they are to be administered; and in courts-martial, courts of inquiry, etc., any deviation from the order laid down is held to invalidate the proceedings. Obviously, the least departure from the strict letter of the statute would be illegal, hence great care is enjoined. The peculiar form or ceremony of administering an oath, however, is subject to such variation as circumstances may render necessary in order to affect the conscience of him who swears. The multitude of religions, and consequent beliefs as to what is or is not binding, gives rise to many forms, and some exceedingly strange ones. For instance, in California, in 1870, one frequently heard of Chinese witnesses being sworn on the body of a recently killed chicken, and Capt. Hughes, in his learned treatise, tells of their being sworn in London by breaking a saucer at the moment.

As a general rule, in Christian countries, the right hand is placed on the Holy Bible, or New Testament, while the oath is being read, and the book is afterwards kissed. Those oaths which immediately concern the naval service are here presented. They differ in many respects and for the better from those in use in the army.

Of Allegiance or Office.—Every person elected or appointed to any office of honor or profit, either in the civil, military, or naval service, excepting the President, and those who participated in the late Rebellion, is required before entering upon the duties of such office, and before being entitled to any part of the salary or other emoluments thereof, to take and subscribe to the following (called the "ironclad") oath:

"I, A. B., do solemnly swear (or affirm) that I have never voluntarily borne arms against the United States since I have been a citizen thereof; that I have voluntarily given no aid, countenance, counsel, or encouragement to persons engaged in armed hostility thereto; that I have neither sought, nor accepted, nor attempted to exercise the functions of any office whatever, under any authority, or pretended authority, in hostility to the United States; that I have not yielded a voluntary support to any pretended government, authority, power, or constitution within the United States, hostile or inimical thereto. And I do further swear (or affirm)

that to the best of my knowledge and ability I will support and defend the Constitution of the United States against all enemies, foreign and domestic; that I will bear true faith and allegiance to the same; that I take this obligation freely, without any mental reservation or purpose of evasion, and that I will well and faithfully discharge the duties of the office on which I am about to enter, so help me God." (Revised Statutes, Section 1756.)

This oath may be taken before any person who is authorized either by the laws of the United States, or by the local municipal law, to administer oaths in the State, Territory, or district where such oath may be administered, and is by law required to be preserved among the files of the department to which it appertains. A less rigorous oath is provided for those who were engaged in the Rebellion, but are not rendered ineligible to office by the fourteenth amendment to the Constitution. The original oath of office, prescribed by act of June 1, 1789, was a marvel of brevity. It read: "I, A. B., do solemnly swear or affirm (as the case may be) that I will support the Constitution of the United States."

Of Enlistment.—A formal enlistment in the public service is incomplete without an oath. By law of July 11, 1798 (remodeled in Revised Statutes, Section 1609), the officers and men of the marine corps were required to take the same oath that was prescribed for the military establishment. That oath, enacted May 30, 1796, was for both officers and men, and has come down to us very slightly changed. It is still administered to the enlisted men, and reads:

"I, A. B., do solemnly swear (or affirm) that I will bear true faith and allegiance to the United States of America; that I will serve them honestly and faithfully against all their enemies whomsoever; and that I will obey the orders of the President of the United States, and the orders of the officers appointed over me, according to the Rules and Articles of War." (Revised Statutes, Section 1342.) In the enlistment papers of the marine corps there is added after articles, "for the government of the army and navy of the United States; and, further, that I am the full age of 21." The latter clause is intended to guard against the enlistment of minors, but is not always successful.

Army and marine officers now take the "iron-clad oath," and, in addition thereto, the former are obliged, "before entering on their duties," to subscribe to the Rules and Articles of War.

Prior to June 12, 1858, civil magistrates were employed to administer the oath of enlistment to recruits. In that year it was made lawful for a commissioned officer to do it, "*provided* a civil magistrate could not be obtained." And by act of August 3, 1861, this provision was removed, and any commissioned officer of the army or marine corps was authorized to perform the duty.

Of a General Court-martial.—When a general court-martial is ready to be sworn, the president of the court first administers the following oath, or affirmation, to the judge-advocate, or person officiating as such:

"I, A. B., do swear (or affirm) that I will keep a true record of the evidence given to, and the proceedings of, this court; that I will not divulge or by any means disclose the sentence of the court until it shall have been approved by the proper authority; and that I will not at any time divulge or disclose the vote or opinion of any particular member of the court, unless required so to do before a court of justice in due course of law."

The judge-advocate then administers simultaneously to all the members of the court, standing uncovered and ungloved as to their right hands, which touch the book (unless they elect to affirm), this oath:

"I, A. B., do solemnly swear (or affirm) that I will truly try, without prejudice or partiality, the case now depending, according to the evidence which shall come before the court, the rules for the government of the navy, and my own conscience; that I will not by any means divulge or disclose the sentence of the court until it shall have been approved by the proper authority; and that I will not at any time divulge or disclose the vote or opinion of any particular member of the court, unless required so to do before a court of justice in due course of law." (Revised Statutes, Section 1624.)

In practice, the judge-advocate usually puts the oath in the plural, and says, "You, A. B., C. D.," and so on, reciting the name and rank or title of each. Every member must be sworn or affirmed before proceeding to trial in each case.

Of Witness.—An oath in the following form must be administered by the president, or senior member, to all witnesses before general or summary courts-martial, and courts of inquiry, and retiring boards, when deemed necessary:

"You do solemnly swear (or affirm) that the evidence you shall give in the case now before this court shall be the truth, the whole truth, and nothing but the truth, and that you will state everything within your knowledge in relation to the charges, so help you God (or, 'this you do under the pains and penalties of perjury')."

Of Summary Court-martial.—Before proceeding to trial the members of a summary court-martial shall take the following oath, which shall be administered by the recorder:

"I, A. B., do swear (or affirm) that I will well and duly try, without prejudice or partiality, the case now depending, according to the evidence which shall be adduced, the laws for the government of the navy, and my own conscience." *After which* the recorder of the court takes the following oath, administered by the senior member: "I, A. B., do swear (or affirm) that I will keep a true record of the evidence which shall be given before this court and of the proceedings thereof."

It will be noticed that summary courts are not sworn to secrecy.

Of Court of Inquiry.—First, by judge-advocate to members: "You do swear (or affirm) well and truly to examine and inquire, according to the evidence, into the matter now before you, without partiality."

By president to judge-advocate: "You do swear (or affirm) truly to record the proceedings of this court, and the evidence to be given in the case in hearing." (Revised Statutes, Section 1624.)

Of Clerk or Reporter.—No form is fixed by statute, but the following is authorized to be administered by the judge-advocate:

"You, A. B., swear (or affirm) faithfully to perform the duty of clerk or reporter in aiding the judge-advocate to take down and record the proceedings of the court, either in short-hand or ordinary manuscript."

Of Interpreter.—No form by statute. Judge-advocate is authorized by regulations for administration of law and justice, U.S.N., 1870 (same as in foregoing), to use this form:

"You, A. B., swear faithfully and truly to interpret or translate in all cases in which you shall be required to do between the United States and the accused."

Oaths, Profane.—Such punishment as a court-martial may adjudge, may be inflicted on any person in the navy "who is guilty of profane swearing."—*Henry C. Cochrane, Captain U.S.M.C.*

Obi. A horrible sorcery practiced among the negroes in the West Indies, the threatened infliction of which is sufficient to lead the denounced victim to mental disease, despondency, and death.

Object-glass. The lens which first receives the rays of light.

Oblimation. The deposit of mud and silt by water.

Occident. The west.

Occultation (Lat. *occultatio*, a hiding). The hiding of a heavenly body by the intervention of some other one of the heavenly bodies. The commencement of the occultation is called the *immersion;* the termination of the occultation is called the *emersion.* The two most important cases of these phenomena are the *lunar occultations* and the *occultations of Jupiter's satellites.*

Oceans. By the term ocean we mean, primarily, the great mass of water that envelopes the globe. The same term is specifically applied to each of the great divisions of that mass of water, five in number. These are as follows:

1. Pacific. This is the largest of the five great oceans. It was first seen by Balboa in 1513, and by him made known to the Europeans. Magellan was the first to traverse it, in 1525, and it has since been explored by many navigators. It extends from the Arctic circle to 60° south latitude. Its width varies from 170 miles at the Kamskatka Sea to 10,000 at the equator, and it contains 77,000,000 square miles. The Northern Pacific contains few islands, and the eastern part of the whole ocean is bare of them; but the western half, and particularly the South Pacific, is full of chains and groups of islands,—volcanic or corallic, as well as many large island masses. Chains of islands and many large seas separate the Pacific and the Asian continent; but the American shore is steep and abrupt, with few indenting bays and inlets. The steady and regular currents and periodical winds favor navigation, and the absence of rough waters and stormy weather has given the name of Pacific to the ocean. But the islands in the south render navigation more dangerous, interrupt the winds and currents, and typhoons and cyclones are frequent in the western part of the ocean. The Pacific has a general wave motion from west to east at the rate of 28 miles a day. The northeast trades extend from 8° N. to 31° N., and the southeast trades from 9° N. to the Tropic of Cancer. The greatest ocean depth yet found was in the Pacific, 4655 fathoms, by Capt. Belknap, in the U. S. S. "Tuscarora." Little ice comes in at the north, but in the south, owing to less interruption from the land, ice-floes come farther north than in the Atlantic. The whale-fisheries of the Pacific are important, and other fish abound.

2. Atlantic Ocean. This is the second in size. It washes the east shores of America and the west coast of Europe and Africa. The Carthaginians were the first to navigate it, and the Northmen—about A.D. 1000—the first to cross it. It extends from 60° N. to 60° S. lat., and is from 930 to 4850 miles wide, comprising 31,000 square miles, but it has a more extended coast-line than all the other oceans, on account of its numerous inlets. It is the highway of ocean commerce, and possesses few dangers to navigation, and regular winds and currents. The Azores, Canaries, Cape Verdes, Bermudas, Madeiras, and a few single islands are found in mid-ocean, and these are out of the track of commerce to some extent. The northeast trade-winds extend from 2° to 27° N., blowing so regularly and evenly that the Spaniards named that part of the sea "Golfo de las Damas,"—"Ladies' Sea." The southeast trades blow between 1° N. and 40° S. Beyond these farther limits the variable winds blow, prevailing from the westward; the mighty Gulf Stream in the north and the southern connecting current in the south favor an easterly voyage. The calmness of the dividing latitudes between the northeast trades and the westerly winds is implied in its name,—"the horse latitudes," a tradition existing that a cargo of horses was thrown overboard in a calm there. So the strong westerly winds are typified in the name "roaring 40's" for those latitudes. In the calm latitudes, 20° to 30°, lie the masses of accumulated sea-weed called the "Mer Sargasso,"—*Weedy Sea.* Storms are frequent in the Northern Atlantic, being generally circular in character, and the "pamperos" of the south, and the "white squalls" of the African coast are enemies to the mariner. The existence of these regular winds and currents has led to a selection of routes between Europe and Asia, and now the steamer traffic is carried on in regular steam lanes. The northern passage follows a path between latitudes 52° to 45°; the middle, between latitudes 35° to 40°; and the southern, between latitudes 10° to 25°,—the latter only from Europe to America. The Atlantic varies in depth, but averages 2000 fathoms. On a plateau in the North Atlantic are laid the telegraph-cables, four in number.

3. Indian Ocean. This, the third in size of the great oceans, extends from the southern shores of Asia to 50° south latitude, and from Australia to Africa, containing 21,000,000 square miles. It contains several large islands, but they form slight impediments to navigation. The southeast trades exist from 20° to 30° south latitude, and beyond them the regular monsoons blow from the northeast from November to March, and from the southwest from April to September. The great masses of land surrounding this ocean are the modifying causes of these winds. Cyclones and typhoons attend the changes of the monsoons, and are at times severe. High seas and strong winds are frequent.

4. Antarctic Ocean. This name is given to the mass of water about the South Pole. It extends to latitude 60° S., and contains some 13,000,000 square miles. It was long considered frozen and impassable for ships, but Commodore Wilkes and

Sir James Ross, in 1841, penetrated into it, and discovered land. Ross ascended to 78° 04′, the highest point reached. A few islands exist, the South Orkneys and South Shetlands being the largest. The winds are strong, and blow in gales, often terrific, towards the equator, and the seas are often immense. But few vessels penetrate into these waters, and those only on fishing voyages.

5. Arctic Ocean. The mass of water about the other pole is called the Arctic Ocean. North of Europe it becomes the White Sea, and north of America the Frozen Ocean. It is the smallest ocean, containing some 7,000,000 square miles, and is partly filled by numerous islands, and the peninsula (or island) of Greenland. It has been the field of hardy exploration for centuries, and Capt. Hall penetrated as far as 82° 16′ north. New efforts are being made to traverse the seas and reach the pole. Ice is more abundant than in the South Sea. Whales, seals, and walrus abound, furnishing subsistence to the hardy inhabitants of the coasts, and making the fisheries important.

The principal phenomena connected with the ocean are its winds, currents, tides, its depth, saltness, temperature, density, and its animal life. The currents, winds, and tides are treated in separate articles. The depth of the ocean is now believed to average 2000 fathoms, or about 2 miles. The greatest depth found is 4655 fathoms, and no greater depth than 5000 fathoms is now believed to exist. Extensive plateaus, mountain ranges, sometimes cropping above the sea-level, and valleys exist. The temperature of the ocean varies with the latitude, but the isothermal lines vary with the currents that carry warm or cold water with them; 70° to 80° is the tropical temperature at the surface, and 50° to 60° the average. (See CURRENTS.) The water of the ocean holds in solution various salts, but the proportion varies with the locality. Near rivers the water is fresher, and in parts of the ocean where evaporation is rapid, it is very salt. With the amount of salt varies the density of the water. With the temperature both these vary, and animal life, now found to be everywhere in the ocean depths, also varies with the temperature, as well as with the depth, density, and saltness of the water. Animal life is far more abundant than on land.—*F. S. Bassett, Lieutenant U.S.N.*

Octans. See CONSTELLATION.

Octant. A reflecting instrument constructed on the same principle as a sextant. See SEXTANT.

Odessa, the most important seaport and commercial city of that part of Russia bordering on the Black Sea, is situated on the shore of that sea, between the mouths of the Dnieper and Dniester, in lat. 46° 28′ 54″ N., lon. 30° 44′ 30″ E. Since 1817, when Odessa was declared a free port, it has continued to make unexampled progress. The harbor affords good anchorage for ships, but they are exposed to the eastern and southeastern gales. Both the town and harbor are strongly fortified. Grain is the leading article of trade, which comprises tallow, hides, beef, butter, iron, copper, wool, etc. Pop. 190,000.

Oe. A violent whirlwind off the Ferroe Islands.

Oferlanders. Small vessels on the Rhine and the Meuse.

Off. Abreast of. The opposite of *near;* as, off the wind. *Standing off*, sailing directly away. *Standing off and on*, approaching the shore on one tack and receding from it on the other. *Off soundings*, in water so deep that bottom cannot be reached by the ordinary deep-sea line. *Off the reel*, see REEL.

Officer of the Deck. The officer who has charge, for the time being, of the management of the ship. On ordinary occasions, one of the watch-officers performs this duty, but, at quarters, it is assumed by the navigator, and when all hands are called, by the executive-officer. The officer of the deck represents the commanding officer, and his orders are obeyed and his position respected accordingly, though his authority is subject to that of the executive-officer. His duties are laid down in the navy regulations. See WATCH-OFFICER.

Officer of the Watch. See WATCH-OFFICER.

Offing. *In the offing*, well to seaward; beyond anchoring-ground. *To get a good offing*, to get well clear of the land.

Off-shore Wind. A wind blowing from the land.

Ogdensburgh is a port of entry, situated on the St. Lawrence River, in St. Lawrence County, N. Y., at the mouth of the Oswegatchie, in lat. 44° 41′ N., lon. 75° 31′ W. The prosperity of the place is principally derived from trade and extensive manufactures of flour, machinery, leather, etc. It has an immense grain-elevator, and about 10,000,000 bushels of grain pass through each year from the West to the New England States. Pop. 11,000.

Ogee. A molding with a concave and a convex outline like the letter S.

Ohm. The unit of electrical resistance; it is the resistance offered by a round wire of pure copper, 10′ long and .01″ in diameter, at 42° F.

Oil-butt. A name for the black-whale.

Oiler. A can for supplying oil to a journal.

Ojanco Snapper. A tropical fish of the *Mesoprion* family, frequenting the deep-water banks of the West Indies.

Oke. A Levant weight of 2¾ pounds, common in Mediterranean commerce.

Old Hand. A knowing and expert person.

Old Horse. Tough salt-beef.

Old Ice. In polar parlance, the ice of previous seasons.

Old Man. A sort of chute used in paying a chain-cable into a lighter. A common appellation for the master of a merchantman and the commanding officer of a man-of-war. *Old woman* is sometimes disrespectfully used to indicate the latter personage.

Old-stager. A person well initiated in anything.

OLD-STAGERISM. An adherence to established customs; sea conservatism.

Oldster. The opposite of *youngster*. It is somewhat difficult to draw the line between an oldster and a youngster, each person drawing it to suit himself.

Old Wife. A fish about 2 feet long, and 9 inches high in the back, having a small mouth, a large eye, a broad dorsal fin, and a blue body. Also, the brown long-tailed duck of Pennant.

Old Woman's Tooth. A peculiar chisel for stub-mortising.

Oleron Code. A celebrated collection of

maritime laws, compiled and promulgated at the island of Oleron, near the coast of Poitou, at or about the time of Richard I. This code was borrowed from the Rhodian laws and the Consolato, with alterations and additions adapted to the trade of Western Europe. It has served as the model for nearly all subsequent sea-laws, and has been admitted as authority on admiralty questions in the courts of this country.

Olick. The torsk or tusk, *Gadus callaris.*

Olpis. A classic term for one who, from a shore eminence, watched the course which shoals of fish took, and communicated the result to the fishers. See CONDER.

Ombre. A fish, more commonly called grayling, or *umber.*

On. *On a bow-line*, or *on the wind*, close to the wind with bow-lines hauled; close-hauled. *On board*, within a ship. *On end*, an-end. *On* is frequently and improperly used for *in*, or *on board;* as, *on* a ship. *On the beam*, in a direction at a right angle to the keel. *On the bow* (or *quarter*), in a direction forming an angle of less than 45° with the head (or stern) of the ship.

One-and-all. A mutinous sea-cry used in the Dutch wars. Also a rallying call to put the whole collective force on together.

Onerariæ. Ancient ships of burden, with both sails and oars.

Onion-fish. The *Cepola rubescens*, whose body peels into flakes like an onion. It is of a pale red color.

On-shore Wind. A wind blowing towards the land.

Oomiak. A light seal-skin Greenland boat, generally worked in fine weather by the women, but in bad weather by the men.

Opah. A large sea-fish (*Lampris guttatus*), called also *king-fish.* Its back is of a steel-blue color, its flanks of a rich green, and its abdomen of a rose color.

Open. Exposed to wind and sea. *To open fire*, to commence firing. *Open hawse*, see HAWSE. *Open ice*, fragments of ice, between which a ship may be forced. *Open order*, see NAVAL TACTICS.

Open-bill (*Anastomus*). A genus of birds of the Heron family (*Ardeidæ*). They are remarkable for the structure of the bill, the mandibles being in contact only at the base and tip, with a wide interval between their edges in the middle. They are natives of the East Indies and of Africa; one species is well known in India as the Coromandel Heron. They frequent the sea-coast and rivers and prey on fish and reptiles.

Ophiuchus (Gr. *Ophiouchus*, "The Serpent-bearer"). A constellation to the north of Scorpio, covering a space not very well supplied with bright stars. *α Ophiuchi*, Ras Alhague. *β Ophiuchi*, Cebalrai.

Oporto is situated on the Douro River, 2 miles from its mouth, in the province of Douro, Portugal, of which empire it was the capital until 1174, and it is now the second city in rank and commercial importance. It has extensive manufactures of silk, woolen, linen, and cotton goods, shawls, leather, etc., ship-building yards, and iron-foundries. The principal trade of the city is in port wine; other exports are bullion, oil, sumac, lemons, oranges, wool, etc. Lat. 41° 9′ N.; lon. 8° 37′ W. Pop. 90,000.

Opossum-shrimp. A crustacean, so named from its young being carried about in a sort of pouch for some little time after being hatched; the *Musis flexuosus* of naturalists.

Oppignoration. The pawning of part of the cargo to get money for the payment of the duty on the remainder.

Opposition. Two celestial bodies are in opposition when their longitudes differ 180°, especially when one of the bodies is the sun.

Oragious. An old term for stormy or tempestuous weather.

Oramby. A sort of state-barge in the Moluccas; some of them are rowed by 40, 80, or even, it is said, 100 paddles each.

Orariæ. Ancient coasting-vessels.

Orbis. A fish of a circular form (the *Chætodon orbis* of Gmelin) inhabiting the Indian seas. It is covered with a firm, hard skin, full of small prickles, but is destitute of scales. It is unfit for food; called also *orb-fish.*

Orbit. The imaginary line which a heavenly body describes by its proper motion.

Orc. Wrack, or sea-weed, used as manure on some of the coasts of England.

Orca. A classical name for a large voracious sea-animal, probably a grampus.

Order-book. A book kept for the purpose of copying such occasional successive orders as the admiral or senior officer may find it necessary to give.

Orderly. A private marine detailed as a messenger for the commanding officer.

Order of Battle. See NAVAL TACTICS.

Ordinary. Vessels are in *ordinary* when they are out of commission and laid up.

Ordinary Seaman. A rating next below that of seaman.

Ordnance. Gunpowder was not employed in Europe to throw projectiles until near the latter part of the 13th or the beginning of the 14th century.

Berthold Schwartz, of Freyburg, to whom, in the old German chronicles, is attributed the invention of gunpowder, but who was rather the disseminator of a knowledge of its ballistic properties, which he had discovered, was the first to employ it to project masses, such as were thrown by the ancient ballista, in mortars and bombards.

The first large bombards were short, resembling in form the modern mortar, and are said to have been made of wood strengthened by iron hoops, or of sheet-iron similarly reinforced with hoops sometimes brazed together. The later bombards, of greater size and strength, were formed of bars of iron arranged like the staves of a barrel and hooped with rings of wrought iron heated and shrunk on. Such were the great gun of Ghent and the Mons Meg of Scotland. The serpentine, of small calibre but of great length, was of similar construction.

Among the most remarkable of the ancient forms was the stone mortar, a truncated cone within and without, the smaller diameter corresponding to the breech, which terminated in a conical screw, by which it could be rigidly attached to a block of wood. All were strengthened by a swell at the muzzle and breech. They had neither trunnions nor handles. In 1427 the bombard was described by Redusius as of wrought iron, and consisting of a tube which, cylindrical in the rear, widened like a funnel towards the mouth.

The forward or widened part was 8 diameters of the ball in length, the rear part 16. The powder was placed in the latter, which was closed with a disk of wood, upon that, in the large part, the stone ball. The charge was ignited through a vent in the rear part.

In 1428 the English employed 15 breech-loading bombards at the siege of Orleans, arms of the preceding century. They were of lengths double or triple their diameters, and half bedded in a sort of wooden case, with which they were consolidated by bolts of iron resting on the tube, and traversing rings nailed to the upper face of the wooden case, their ends keyed. In loading, the movable chamber, filled with powder, was adjusted to the walls of the bore, a wad of hay pushed down from the muzzle, and after that the ball.

In 1439 the two parts composing the bombard, of iron or copper, were cast together or reunited on the same piece of oak. Towards the close of the 13th century iron balls came into use. In 1378 they were cast both solid and hollow at Augsburg, as were also bronze guns; and from that time guns approached their present forms, but were at first of such dimensions and weight as to be unwieldy.

The Turks had, in 1453, guns cast by Hungarian founders of 27-inch calibre, throwing stone balls of from 850 to 1200 pounds, which could be fired only four times in a day. The heaviest required to transport it 200 men and 70 yoke of oxen. One of them burst at the siege of Constantinople with destructive effect at the first discharge.

Such are the guns—Kemerlicks—seen by Von Moltke in the batteries of the Dardanelles in 1828, and by him described as gigantic guns, some 28 inches in diameter, into which a man might creep up to the breech. They lie on the ground on sleepers of oak, instead of gun-carriages, with their butts against strong walls so as to prevent recoil, as it would be impossible to run them forward again in action: some of them throw stone balls of 1570 pounds weight, with charges of more than a hundred-weight.

Bishop Pococke describes one of iron, "20 feet long, in two parts, after the old way of working cannon of iron in several pieces. The bore is 2 feet, so that a man may sit in it; 2½ quintals of powder are required to load it, and it carries a ball of 14 quintals."

The first foundries in Germany were not established until 1440. Up to that period only a few cities and wealthy princes possessed one or two large bombards.

In 1478, Louis XI. caused 12 guns—the Twelve Peers of France—of 45 pounds calibre to be cast; also a large bombard which threw an iron ball of 500 pounds weight, with a charge of 300 pounds of powder. By a premature discharge of this piece in the same year 14 persons, among them Jehan Mangué, its maker, were instantly killed; 15 or 16 wounded, several fatally; and a poulterer, tending his flock in a distant field, was killed by the ball.

In 1494, Charles VIII. invaded Italy. This prince, with an army of 20,000 men, had thirty-six 48-pounder bronze siege-guns, 8 feet long, weighing 6000 pounds; 104 field-pieces,—culverins, falcons, and falconettes, with other guns of less calibre, but of greater comparative length, all on wheel-carriages drawn by horses. "With these guns were made more discharges in a few hours than had before been made in several days."

In the reign of Francis I. progress was made in the improvement of ordnance. From that time efforts were made to fix thickness and calibre of guns, to improve powder, to establish proper charges, and to adopt improved processes in the foundries.

In 1521, Charles V. caused experiments to be made at Brussels to determine the most advantageous length of guns; the pieces, 48-, 36-, and 24-pounders, were cast of extra length, with five muzzle swells at which they were successively cut off. The greatest ranges were given by 18, 20, and 22 calibres respectively; a length of 18 calibres was adopted for all.

In 1535 he had 12 guns of new proportions cast at Malaga,—the Twelve Apostles,—40-pounders. These pieces long served as models for cannon-founders in Europe. They had a reinforce at the chamber; length of bore, 18 calibres; length of reinforce, 8 calibres; the thickness in $\frac{1}{8}$ of a calibre, 7, 5, 3, at the chamber, trunnions, and neck; weight of the gun, 6300 pounds, and of the charge, 20 pounds. Improvements continued to be made in France until towards 1550, when civil war interrupted progress until the end of that century.

In 1547 *cast-iron* guns are said to have been in general use in England.

In 1572, Charles IX. suppressed the great variety of calibres then in use under various names, substituting seven,—from the 42-pounder of 9200 pounds weight, 11 feet long (double cannon), to the ½- and ¾-pounders of from 200 to 400 pounds weight, 6½ feet long (falconet).

About the middle of the 16th century many guns exploded with fatal effect, and among other causes assigned by Fronsperger, in 1555, was the use of fine-grained powder instead of the large common powder.

In 1540 large-grain powder was preferred to fine for large calibres.

In 1546, according to Tartaglia, cannon-powder was not grained, but musket-powder was.

The compositions most used were—

For Large Calibres.		Medium.	Small-Arms.
Nitre	50	66.7	83.4
Sulphur	33.3	20	8.3
Carbon	16.7	13.3	8.3

In 1593, as given by Vignère, the composition of French war powder was as follows:

	For Cannon.	Arquebuse.
Nitre	75.68	71.43
Sulphur	10.81	14.285
Carbon	13.51	14.285

The cannon-powder was in grains of the size of small hazel-nuts.

In 1606, St. Julian, in his "Forge of Vulcan," published in Holland, says, "With large cannon-powder the charges are one-half, sometimes three-fourths, of the weight of the ball. But when the use of musket-powder began the charges were reduced to less than half."

He thought that effort should be limited to improving the quality of powder while preserving its grain, and that the wad of hay placed on it should be as large as possible.

From this it appears that while on the one

hand it was sought to reduce the initial pressure of the gases in large guns by adjustment of proportions of the components of powder, on the other, the better means—air-space and large-grain powder—had at that early day its advocates.

In Italy, about 1597, cannon, properly so called, shorter than the culverins, having been suppressed, only culverins of 14 and 30 pounds calibre were cast.

In the same year Savorgano, who had previously cast for the galleys guns 36 calibres in length, $\frac{1}{4}$ of a calibre thick at the breech, invented a new breech-loader, its calibre that of the sacre,—12-pounder,—but having greater range than the *petriera a braga*. The piece was closed from the side of the breech by a bronze wedge which traversed it. The ball was attached to the cartridge. The *petriera a braga* was invented by Beccalua; some of 12, others of 14 pounds calibre, their weight 62 times that of the shot. The chamber movable. A thick wad was placed in the piece, then the ball, and after that the charged chamber secured by an iron wedge attached to the carriage, the forward end of which rested upon two supports.

In 1605, Henry IV. had 50 pieces—45-pounders—all alike. Sully, Grand Master of Ordnance, said such a park had never been seen before. The 60-pounder was suppressed as too difficult to transport, and rendering no better service than the 40-pounder. All guns were richly chased. In 1609, in Spain, the calibres were reduced to four, 40-, 24-, 10-, and 5-pounders; lengths, 19, 24, 29 calibres; ratios of weight of gun to shot, 180, 235, 380. Some time before this there had been added to the culverins then in use in these states battering guns of the calibres 96-, 48-, 24-, 12-, and 6-pounders; lengths, 17, 18, 20, 24, 29 calibres. To these guns the modern French 24- and 12-pounders owe their origin.

Iron guns are said to have been cast at Erfurt in 1377, in Silesia in 1440, in England in 1547, in Hartz in 1626, and in Prussia in 1667. Nearly all the earlier writers considered cast-iron guns as less strong than bronze, but no mention is made of explosions. As the windage was large, the mode of charging such as gives low pressures, and the powder less violent, accidents were probably rare.

In 1626, Gustavus Adolphus employed the so-called leather guns, invented by Col. Wurmbrand. The cylinder of bore, of copper, 15 calibres in length, an eighth of a calibre in thickness, lightly reinforced about the seat of the charge; the vent-tube of iron, screwed to the cylinder of the bore. The bottom of the bore was formed by the face of a bronze breech 1 calibre in length, with a button, and fixed to the copper cylinder by 6 screws. Strong rings of iron added to the solidity of the cylinder around the charge. At the forward extremity the copper was rolled on itself to form a muzzle swell. The cylinder, coated with several layers of mastic, was wrapped with rope and twine, giving a thickness of 1 calibre to the first reinforce, and $\frac{3}{4}$ to the chase, which served not only to strengthen it, but to secure the trunnions. Over this was placed a coat of plaster, giving an even surface. The whole was then covered with leather.

In 1631 these guns were discarded, for, in consequence of the non-conductivity of the enveloping material, they became so hot at the battle of Leipsic as to ignite their charges. The charge being limited to one-quarter the weight of the ball, their range was short.

In 1640 large gun-foundries were established in Sweden.

The word "mortar," or "mortier," appears to have been first applied to pieces employed by the Turks at the siege of Belgrade, in 1456. They had also, at the siege of Rhodes, in 1522, 12 bronze mortars throwing copper bombs, consisting of two hemispheres inclosing inflammable matter and small hollow balls which burst (grenades). Mention is made of bombs larger than hand-grenades at the bombardment of Arles, in 1536.

Bombs 11 and 19 inches in diameter, with fuzes which screwed into the eye, were employed at the siege of Boulogne, in 1542.

In 1606, according to St. Julian, mortars were of the calibres 6, 12, and 18 inches. They had trunnions at the middle of their lengths, without rim-bases or reinforces; the charge, 1 pound of powder for each 30 pounds of the weight of the bomb. The chambers of some were cylindrical, of others concave, spherical, or pear-shaped: some of the latter in the 12-inch containing 18 pounds of powder. The bombs of the 18-inch weighed, empty, 490 pounds; filled, 538 pounds.

Knowledge of the bomb and of mortar-firing was introduced from Holland into France by Malthus in 1634.

In 1637 fatal accidents occurred in igniting the fuzes of bombs in mortars prior to discharge. In 1638 it was observed at Versailles that the fuze could be ignited by the flame of the charge, but it was not until 1751, when Le Duc had shown by extended experiments the certainty of ignition, that the method was changed.

The small mortar introduced into France by Coehorn in 1679, and to which his name was given, was invented by Holts in 1668.

In 1691 the 18-inch bomb was named by Louis XIV. "Comminges," after an officer of remarkable girth. In 1697 they were employed at the siege of Ath. In 1733, at the siege of Trarbach. In 1745, producing little effect at the siege of Tournay, and being difficult to transport, they were discarded.

The partridge mortar (*mortier à grenade*) was invented by Petri in 1693. In addition to the ordinary bomb, it projected 13 grenades from as many barrels disposed circularly around an 8-inch mortar, which weighed 205 pounds,—the total weight 241 pounds; charge of the 8-inch, $\frac{1}{2}$ pound; of the others, proportionally less. It was introduced in France in 1700.

Machinery for boring cannon, invented in Switzerland by Lew, was introduced into France by the founder Maritz, who cast the first solid gun in 1713. Until 1721 service guns were cast hollow. In that year, the brothers Keller invented a vertical borer which cut out the cylinder of the bore in a single piece.

In 1744–45, Maritz suppressed hollow casting at Strasbourg and Douai, establishing horizontal boring machinery, and in 1755, as general inspector of foundries, applied the same process to iron guns, employing only the softest iron. In the same year solid casting for bronze guns was adopted in Holland and Prussia. In hollow casting it was difficult, with the imperfect means

then in use, to maintain the core in position. Cavities formed in the metal about it, and scoria did not rise freely. Especially was this the case with the very soft iron employed by Maritz, who obtained more nearly perfect forms by casting solid. The iron guns cast by Maritz were deficient in strength; many failed to resist proof, and others burst on board ship. In consequence, the control of foundries of naval guns was transferred to the navy department, with some advantage; but in 1779 it was found necessary to increase the thickness of metal.

Montalembert, who preferred solid to hollow casting, had pointed out, in 1764, the inferiority of the soft, spongy iron employed by Maritz, and explaining the effect of sudden cooling in rendering iron brittle, indicated the course to be pursued in the construction of stronger guns of harder and more tenacious iron. The views of Montalembert were in advance of his time, and were neglected.

In 1732 the system of De Vallière was adopted. Guns, 24-, 16-, 12-, 8-, and 4-pounders; mortars, 12- and 8-inch; stone mortars of 15-inch, and howitzers of 8-inch; the bottom of the bore of guns rounded out $\frac{1}{4}$ calibre; small chambers at the bottom of the bore were retained only in 24- and 16-pounder guns.

The windage and thickness of the metal were proportional to the diameter of the ball; thickness at breech, 1 diameter; at the beginning and end of the first reinforce, $\frac{24}{24}$ and $\frac{22}{24}$; of the second reinforce, $\frac{20}{24}$ and $\frac{19}{24}$; at the commencement of the chase, $\frac{17}{24}$, and at the astragal of the neck, $\frac{11}{24}$; and finally, $\frac{16}{24}$ at the swell of the muzzle.

The dimensions of the moldings were expressed in terms of the diameter of the bore divided into 36 parts. The length of the cascabel, its neck, the bottom of the breech, and the projection and size of the trunnions, the axis of which was tangent to the lower surface of the bore, were not altered. The length of the two reinforces and chase preserved their relation to that of the piece; the sight and pointing-button were suppressed. The 8-inch mortar was for short ranges. The 12-inch were of three kinds, one having cylindrical chambers containing $5\frac{1}{2}$ pounds powder.

Two of the new guns cast at Lyons, and proved by De Vallière, were discharged 1500 times in quick succession, with charges of one-third and one-half the weight of the ball, without injury to the chase or bore,—the vent of one scarcely widening at all, that of the other a little. The vents were in a piece of pure copper, which was placed in the mold before casting. De Vallière designed the screw bouche, which was found to answer the purpose, but was not then adopted. Until 1739 the charges of guns had been two-thirds the weight of the ball. In that year Belidor determined, by experiment at La Fère, that a charge of about one-third was sufficient for all calibres. The French service charges were therefore reduced to that ratio.

The first of De Vallière's howitzers was cast at Douai, in 1749. The bore 3 diameters in length, the chamber cylindrical, 7 inches long, and 3 inches in diameter. The first howitzers *used* in France were taken from the allies at the battle of Nerwinden, in 1693. In 1741, the king of Prussia having introduced very light iron guns into field service, the French attached to each battalion a Swedish 4-pounder, $4\frac{1}{2}$ feet long, of about 600 pounds weight, which could be fired with ease ten times in a minute.

But the weight of the heavier guns of the model of 1732, forming the heavy artillery, prevented full advantage being taken of the lightness of these pieces for extended movements. Austria and other powers lightened their heavy artillery, and in 1756 the French, as proposed by De Broglie, bored up their 12-pounders and 8-pounders to 16-pounders and 12-pounders. The guns were then, however, deficient in strength and badly proportioned.

Experiments at Strasbourg, in 1764, preparatory to the improvements proposed by Gribeauval, showed that 12-, 8-, and 4-pounders, reduced in length to 18 calibres, the ratio of weight of gun to that of ball being 150, had the required range and sufficient mass. It was decreed in 1769 that there should be two classes of guns; the first, 24-, 16-, 12-, and 8-pounders, for the attack and defense of fortresses; the second, of 12-, 8-, and 4-pounders, for field service, a 1-pounder for light troops. The old 8-inch mortar, a new 10-inch with cylindrical chamber, and the stone mortar were retained. The 8-inch howitzer appropriated to siege purposes, the 6-inch to field service. A few slight alterations were made in siege and garrison pieces of the models of 1732. The length of the second reinforce was increased, to include the rim-bases added to the trunnions; the handles received a more simple form, many moldings and ornaments were suppressed, as well as the small chamber at the bottom of the bore. The sights and buttons were preserved. The centre of gravity and the trunnions were thrown a little more towards the breech.

Field-pieces were 18 diameters of the ball in length. The diameter of the ball was subsequently increased to diminish the windage. Siege- and garrison-guns were proved by 4 discharges, 2 of one-third and 2 of two-thirds the weight of the ball. All to be cast solid. The stone mortars were cast hollow. Elevating screws replaced the quoin. These changes excited much discussion, but experiments at Douai in 1772 and 1785 established their propriety.

In 1789 the Gomer mortar was adopted,—chamber a truncated cone. The trunnions, their axis intersecting the middle of the chamber, were reinforced. There were three calibres,—12-inch, 10-inch, and 8-inch,—their profiles similar.

The calibres of cast-iron guns for coast defense were determined in 1790: 36-, 24-, 16-, and 12-pounders; mortars 12-inch and 10-inch, with chambers in the form of a truncated cone, containing 11 pounds of powder.

Notwithstanding the advantages of Gribeauval's system, it was apparent that it could be rendered still more simple. Steps were being taken to perfect it when, in the year XI (1803), a decree overturning the whole system of artillery substituted ill-considered innovations. By this decree all guns were to be cast without reinforces or moldings, in the form of a truncated cone from the breech-ring to the tulip.

To avoid the complication arising from the multiplicity of calibres, in the campaigns of 1808 and 1814, guns of Gribeauval's system, exclusively, were supplied to the armies in Spain and Portugal, whilst the 6-pounder, adopted by the

decree of 1803, was supplied to the other armies, thus practically returning to the system of Gribeauval, which was gradually perfected in matters of detail.

In 1804 there were cast at Douai four 11-inch bronze howitzers (*canons-obusiers*), proposed by Col. Villantroys, and subsequently two others of the same calibre. Length of bore 8 calibres. These guns gave ranges of 2400 toises (5117 yards) and upwards. One of similar character, designed by Gen. Ruty, cast at Seville in 1811, gave, with charge of 33 pounds and a bomb filled with lead, weighing 181 pounds, a range of 2790 toises (5948 yards). One of iron, Villantroys's, cast at Liege in 1813, length of bore 8 calibres, weighing 8491 kilogrammes, with a charge of from 30 to 60 pounds, and a bomb of 180 pounds, sabot of 13 pounds, gave a range of 2671 toises (5694 yards).

Bronze guns were in general use in England in 1768, when John Muller urged, on the ground of lightness and economy, the substitution of cast-iron guns, referring, in illustration, to the armament of the "Royal George," consisting of 100 bronze guns, weighing 218.2 tons, costing £28,366. The same number and calibre of his model would weigh 127.8 tons, and cost £2044.

This and other propositions were favorably received, and the expenses reduced. When the "Royal George" sank at Spithead, in 1782, the bronze 42-pounders on the lower deck had been replaced by iron 32-pounders, but she still had bronze 24-pounders on main-deck, quarter-deck, and poop, and bronze 30-pounders on the middle-deck. The carronade, 12-pounder to 68-pounder, invented by Gen. Melville, and first cast at the Carron Works, of which Gascoigne was the manager, was adopted as a navy gun in June, 1779,—10 to each ship, from first-rate to sloop.

Sir William Congreve is said to have been the first to propose diminishing the quantity of metal about the chase, and to increase that about the seat of the charge. The profile of the 24-pounder Congreve gun of 41 hundred-weight, 7 feet 6 inches long, is, from base-ring to muzzle-astragal, nearly a straight line, interrupted by two flat rings, one at the front of the vent-field, the other just forward of the trunnions; the axis of the latter tangent to the lower surface of the bore. The angle of dispart, 5°; ratio of weight of gun to shot, 180; length of bore in calibres, 14.5; thickness at base-ring, 1.5; at neck of chase, .5.

In 1814 experiments of comparison were made at Sutton Heath with the Congreve and Blomefield 24-pounder guns, the latter longer and heavier than the Congreve gun, and an ordinary long 24-pounder. In these experiments the guns, being pointed by the line of metal, the extraordinary dispart of the Congreve gun gave correspondingly extraordinary ranges, attributed at the time to the weight of metal at the breech rather than to its form. But, in 1815, Olynthus Gregory subjected three 6-pounders of the new models to test with the ballistic pendulum. The initial velocities were greatest for the common, and least for the Congreve gun. Comparison of the Congreve and ordinary long 24-pounder was also made with the same result.

Monk, in 1838, and Millar subsequently in his shell-gun, suppressed the ring immediately in front of the trunnions of the ordinary gun, connecting the second reinforce with the chase, and the base-ring with the first reinforce, by concave curves.

Of Monk's 32-pounders, 4279 were proved without a failure. In these guns was a nearer approach to a distribution of metal proportional to the pressure at points along the bore than had before been made.

In the guns modeled according to the construction proposed by Commodore Wadsworth, of the U. S. navy, in 1845, all rings, excepting the muzzle- and base-rings, were suppressed, and the profile approaches that of the Dahlgren gun, in which the lines are unbroken.

French ship-batteries.—In 1812 the calibres were 36-, 24-, 18-, and 12-pounder cannon and carronades. In 1829 the 30-pounder, of various weights, was adopted for all batteries. In 1837 the 80-pounder Paixhan gun was assigned a place. The decree of 1848 increased the number of 22-centimetre shell-guns, and that of 1849 introduced 50-pounder cannon as a substitute for some of the former; it also suppressed the carronade.

English ship-batteries.—Previously to the war of 1812 the long 32-pounder predominated as the principal piece for the heaviest ships, and in frigates the long 18-pounder. In 1839 the 32-pounder, six classes of different weights, was adopted. With these were combined 8-inch shell-guns of 65 and 53 hundred-weight. In 1848 more than 8000 new and reamed 32-pounders were available, and about 1600 shell-guns. The 10-inch shell-gun of 84 hundred-weight, and the 68-pounder of 95 hundred-weight, were adopted as pivot-guns.

United States ship-batteries.—The new ships built after the war of 1812 were armed as follows: Frigates, gun-deck, 32-pounders; spar-deck, 42-pounders. Liners, lower-deck, 42-pounders; gun-deck, 32-pounders; spar-deck, 42-pounders. In 1841 a few 8-inch shell-guns (63 hundred-weight) were introduced. In 1845 the 32-pounder was adopted as unit-calibre,—six classes, weighing severally, 56 hundred-weight, 51 hundred-weight, 46 hundred-weight, 42 hundred-weight, 32 hundred-weight, and 27 hundred-weight; the shell-guns of 63 hundred-weight and 55 hundred-weight being almost identically the English system. In 1853 it was directed that ten 8-inch shell-guns of 63 hundred-weight should form an entire division on the gun-decks of liners and frigates. None on the spar-deck.

The *columbiad*, a heavy gun combining the qualities of the gun, howitzer, and mortar, was invented by Col. Bomford, and used in the war of 1812.

In July, 1841, experiments proposed by Col. Bomford to determine the expansive force of powder in a gun by firing pistol-balls through its sides, were made at Watertown Arsenal. Lateral tubes were inserted at intervals of 2 calibres. The balls were fired vertically into a series of pine boards half an inch thick, and seven-eighths inch apart. The number of boards penetrated gave the force exerted. This method was improved by Major W. Wade, the bullets being discharged horizontally into a small pendulum. The gun was bored through the breech and fitted with a movable plug, in order to vary at will the distance of the fixed barrels from the bottom of the bore.

In 1843 the results were reported to Col. Talcott.

Distance of Barrel from centre of Ball, in calibres.	Relative Velocities.
In rear, 1	1.0000
At the centre, 0	.9758
In front, 1	.8149
" 2	.6767
" 3	.6135
" 5	.5291
" 7	.4393
" 9	.3988
" 11	.3667
" 15	.2858

In 1844 a 10-inch columbiad and an 8-inch columbiad of new model were tested. The 8-inch burst at the 729th fire; the 10-inch at the 600th fire with service charges.

In 1849 two 8-inch columbiads were cast at the Fort Pitt Works,—one solid, the other according to the plan invented by Lieut. Rodman, on a hollow core through which a stream of water passed while the metal was cooling. The solid cast burst at the 85th, and the hollow at the 21st fire; service charges, 14 pounds.

In May, 1850, Lieut. John A. Dahlgren, of the navy, proposed to the Navy Department the construction of a gun in accordance with a design which he furnished. In 1852 the first gun of this design was constructed by the United States. The proportions, in calibres, are as follows:

Length of fort	2.389
" junction	2.778
" chase	6.833
Length of bore	12.000
" breech	1.511
From face of muzzle to end of breech	13.511
Diameter at commencement of fort	3.022
At division-line between junction and chase	2.036
At muzzle	1.400

From a point .35 of a calibre forward of the fort, the profile of the gun, for a distance of 2.28 calibres, corresponds with a line drawn with the aid of a draughtsman's batten through the extremities of ordinates representing the pressures determined by Wade at corresponding distances in calibres from that point, the maximum pressures corresponding to maximum *thickness*. This embraces the *junction*. Thence, from a point 4.39 calibres from the bottom of the bore, the profile approaches the axis, until, at the distance of 5.61 calibres, the difference between it and the pressure-curve is 0.1 calibre; after which it continues nearly parallel to the curve of pressures.

At the commencement of swell of muzzle—the thinnest part of the gun—the difference is 0.2 calibre.

It appears that the Dahlgren gun presents the first practical application of results obtained by experimental determinations of pressure at different points along the bore, by such methods as were proposed by Col. Bomford,—that is, by boring holes in the walls of the gun, through which the pressure acts upon other bodies, such as pistol-balls, pistons, etc.

This, with the hemispherical breech and suppression of all rings, gives the gun that symmetrical appearance which is its characteristic feature.

The proving and testing of the Dahlgren shell-gun was continued during the years 1852–54.

The first 11-inch shell-gun was fired 500 times with shells, and 655 times with shot weighing 170 pounds, without bursting, which occurred at the 1959th round; the service charge, 15 pounds.

In 1853 the endurance of navy guns of different classes was tested at Old Point Comfort by Commander D. G. Farragut. Two shell-guns exhibited remarkable powers of resistance. A 10-inch of 88 hundred-weight, cast in 1848, fired 275 rounds, 1 shell of 104 pounds, 10 pounds powder; 28 rounds, 2 shells of 103 pounds, 8 pounds powder; 8 sets of firings of 5 rounds each, with solid shot of 130 pounds weight, and an additional shot for each set after the first; the last set with 8 shot, charge, 14 pounds of powder throughout; followed by 52 rounds with 8 shot and 18 pounds of powder; 11 rounds with 8 shot and 20 pounds of powder; a slight increase of the bore over the seat of the shot, and the wear of the vent being the only evidence of injury.

The 8-inch of 55 hundred-weight, cast in 1845, with proportional charges, gave equally favorable results.

It appears from this that the service charge of the 10-inch, 10 pounds, might have been made more nearly commensurate with the calibre of the gun.

In 1851, to test still further the Rodman plan, two pairs of 8-inch and 10-inch columbiads were cast, one of each pair solid, and the other hollow and cooled as before.

The 8-inch solid burst at 73 fires.

The 8-inch hollow burst at 1500 fires.

The 10-inch solid burst at 20 fires.

The 10-inch hollow burst at 249 fires.

In 1856 two 10-inch columbiads, one hollow, the other solid, were tested. The solid cast burst at the 26th fire, the hollow at the 31st fire.

In January, 1857, Rodman recommended, "as the requisite knowledge to manufacture guns of those calibres which can be relied upon for any given number of fires is not possessed, that the casting of service columbiads be discontinued for the present."

In 1857 three 10-inch columbiads, 2 solid and 1 hollow cast, were tested. The 2 solid cast burst at the 169th and 399th fires respectively. The hollow cast was unbroken after 1600 rounds.

In 1858 two 10-inch columbiads, one solid, the other hollow cast, withstood 2396 rounds each with service charges; 54 rounds with charges of from 15 to 18 pounds; 2450 rounds, exclusive of proof charges. Subsequently they were each fired 1632 rounds with 18 pounds of powder and a solid shot, making a total of 4082 service and 2 proof charges for each gun. Neither gun broken; the solid most worn.

The guns of 1857 were of the old columbiad model modified to the extent of the removal of the base-ring and swell of the muzzle; while those of 1858 were of a new model without chambers or ratchets in the breech, and with increased thickness of metal in the breech, being over 1½ calibres thick at that part. The cascabels, with slender necks, dropped from the guns in the course of the firing. The profile was unchanged, with the exception of that due to substitution of a cascabel for the ratchet.

In 1857–58, at Alleghany Arsenal, Rodman first applied the pressure-gauge (piston and indenting tool) to determine the pressure of gas in the bore of a 42-pounder, at the bottom of the bore and at intervals of 2 calibres. This

method he had suggested to Major Wade as early as 1851.

In May, 1860, was completed the first 15-inch gun cast and cooled upon the Rodman plan. The form was determined on the hypothesis that "the pressure is inversely as the square root of the space behind the shot. The expression for the tangential resistance which enters the formula for the bursting tendency, was derived from the hypothesis that, in this resistance, the strain developed by the action of a central force in the concentric elementary cylinders, of which we may suppose the gun to consist, diminishes as the square of the distance from the axis increases." Experiment indicated that it would be unsafe to assume the strain to diminish in a less ratio. As the compressibility of the metal prevents the full development of both the transverse and tangential resistance, only one-third of the theoretical transverse resistance was used in computing the exterior radii of the 15-inch gun. The gun was purposely made somewhat heavier in the chase than the hypothesis that the pressure is inversely as $\sqrt{L}$ would give it, with a view to the employment of charges producing more uniform pressure, and consequently greater pressures in the chase of the gun, for a given maximum pressure, than is obtained by the use of ordinary powder.

Rodman recommends that the beginning of the taper should be about half a calibre forward of that part in which occurs the most rapid diminution which the law of pressure would give it. The exterior form and proportions of the gun, as cast, are similar to those of the Dahlgren gun. The trials with the gun were very satisfactory, and simultaneously with this result was demonstrated the superiority of Rodman's perforated cake and very large-grained powder for guns of great calibre.

Rifled Cannon.—Robins, whose "New Principles of Gunnery" was published in 1742, recognized the superiority of the rifle to the smoothbore, and his prediction of advantage to the state which should first adopt it has been verified.

In 1774, Dr. Linn and Capt. Alexander Blair, of the 69th Regiment of Foot, invented a species of rifled field-pieces of cast iron, of 1 or 2 pounds calibre, the grooves—6 in number, of semicircular section, $\frac{1}{30}$ calibre in depth—making one turn in the length of the bore, 22 calibres, and cast upon the core, were, at 2 calibres from the bottom of the bore, of full depth, diminishing and ending at $1\frac{1}{2}$ calibres from the bottom. Bullets, of lead with 6 buttons cast on them to fit the grooves. These rifles had telescopic sights with cross-hairs and graduated sectors, and were mounted on carriages. It was then asserted that "rifled ordnance of any calibre might be made to carry iron shot for battering or for other purposes, provided holes that are a little wider at their bottom than at their upper parts be cast in a zone round the ball for receiving afterwards leaden knobs (studs), to fit the rifles of the cannon."

Under Napoleon III., and in the light of what had been done by Wahrendorf, Cavalli, and others, rifled field-pieces were constructed in France in 1854 which, with improvements suggested by experience in Algeria and Cochin China, were employed with great effect in the Italian campaign in 1856.

In 1858 the light Armstrong gun was adopted for field service in England. And in 1859 the Armstrong system, breech-loading and welded coil, was completely adopted by the government —40-, 70-, and 110-pounders—for the navy.

The failure of these guns as breech-loaders led to the substitution of muzzle-loaders.

About the same time the Russians substituted Krupp's breech-loaders for his muzzle-loaders.

Breech-loaders.—In the infancy of ordnance there were many breech-loading bombards, some of large calibre; but with the increased tension to which the employment of iron projectiles gave rise, the mechanical devices of that day were insufficient to resist the pressure, or to prevent leakage of the gas, and the consequent wearing away and final yielding of the fermature. And although in more recent times attempts were made to accomplish so desirable an improvement, they met, as in the case of Montalembert's wall-piece, with but partial success. It was not until after 1843 that the forms devised by Wahrendorf and Cavalli were developed. Nor, until they were united and combined with the Broadwell gas-check (the principle of action of which under fluid-pressure had been illustrated by Bramah in his invention,—the *cupped leather collar* of the hydraulic press), was it known that a properly constructed breech-loader is stronger than a muzzle-loader of the same calibre with a solid breech.

Built-up Guns.—Since the circumferential tension or hoop-tension in a hollow cylinder is not uniformly distributed when the thickness is great as compared with the radius, constructors of guns have endeavored by special dispositions of parts in connection with different physical properties of cast iron, wrought iron, steel, etc., to distribute the tension more uniformly. First, by subjecting the interior tube or tubes to compression under the permanent tension of encircling hoops shrunk or forced on by pressure; or by the employment for the inner tubes of that metal which within its elastic limit stretches most.

The systems of "initial tension" and of "varying elasticity," as they are called, are employed separately or together.

In reinforcing cast-iron guns by rings shrunk upon them, Capt. Blakely employed the system of initial tension, and in the Blakely gun combined with it that of varying elasticity; the inner tube of low steel, the next of high steel, over which an outer cast-iron jacket, to which the trunnions were attached, was placed with sufficient tension to make contact.

The Parrott gun is, in the words of its inventor, "a hooped gun of the simplest kind, composed of one piece of cast and one of wrought iron. It has no taper, no screw, no successive layers of hoops."

Parrott guns of various calibres were much used during the war 1861–65. The 30-pounder and smaller calibres exhibited remarkable endurance.

The 100-pounder was regarded with some distrust, several exploding during the war. They had good range, were accurate, and were highly prized by the Confederates when they chanced to fall into their hands.

The Brooke guns, rifled, were of cast iron reinforced, during the first part of the war, by a single series of bands, each 2 by 6 inches, extending

from the breech to near the trunnions. Subsequently, the thickness of cast iron was reduced, the cylinder of the gun extended to just beyond the trunnions, and a second series of bands was shrunk upon the first, breaking joints. The trunnions and sight-masses were united with the gun by curves. There were 3 calibres: 6.4-inch, 7-inch, and 8-inch. The 7-inch and 8-inch were chambered; form, frustrum of cone with hemispherical bottom. The bottom of the bore of the 6.4-inch terminated in a hemisphere. There were also three 7-inch rifles, of extra length, cast without trunnions, and reinforced by three series of 6 by 2 inches wrought-iron bands. The trunnions were forged with their band in one piece or cast in bronze. The trunnion-band was slipped on loosely, the shock of recoil being transferred by a heavy wrought-iron breech-strap to the trunnions and carriage.

Several 10-inch and 11-inch guns, cast with trunnions, but of extra length, were reinforced by two and three series of bands, respectively, in rear of the trunnions, but were not rifled. Spherical projectiles of steel, tempered in oil, were made abroad for them, with which large charges of powder were to be used.

Repeated attempts have been made to forge large wrought-iron guns of bars, disks, or rings welded into a single piece, capable of withstanding modern charges, but without success. It is impossible to detect faults of welding in such large masses, and no confidence can be placed in guns so made even after proof. A heavy wrought-iron gun, forged in 1843, burst on board the U. S. S. "Princeton" with fatal effect.

Sir William Armstrong, who, in 1854, proposed to construct rifle-cannon for the English government, succeeded in forming tubes, or pipes, or cylinders, by coiling spirally long bars of iron into tubes, and welding them upon the edges, as is done in gun-barrels. Of these he composed guns of great strength. Three such tubes united by welding the joints were sufficient for a 25-pounder gun. The welded coils were shrunk upon a steel tube. Subsequently, the inner tube was made of coiled iron, but experience demonstrated the superiority of steel.

The 9-inch 12-ton gun consists of a solid ended steel barrel, a forged breech-piece, a cascabel, a B tube, a trunnion-ring, and 7 coils,—12 separate parts. The breech-piece, formed of wrought-iron slabs welded together, drawn out, bored, and turned, is shrunk upon the steel tube, toughened in oil. The cascabel-screw receives, in conjunction with a shoulder at rear end of breech-piece, the endway pressure of the steel tube. Two coils welded together form the B *tube.* The breech-piece and B coils are connected by a hook-joint, the rear end of each being hollowed out to receive a corresponding annular projection of the forward part of the other.

The steel tube is designated by the letter A; the successive series of superimposed coils by the letters B, C, D, E. The coils in each series are numbered from the rear, forward. The B tube is the terminal envelope of the A tube.

In the 100-ton gun the A tube is composed of two parts joined by a ring. The forged breech-piece is replaced by a heavy coil, which forms part of the B tube. The trunnions are shrunk on the B tube; the vent is axial.

The Frazer gun is a modification of the Armstrong, consisting of a few long double and triple coils, instead of several short single ones, and a forged breech-piece. The A tube of the English service gun—Woolwich gun—is bored out of a solid hammered ingot of cast steel, and oil-tempered. The B tube is composed of two single tapered coils, united by a joint, and welded endways. In 7- and 8-inch guns the breech-coil is composed of a triple coil, in which the middle coil is reversed, a double coil, and a trunnion-ring. The forward end of the triple coil is turned down to form a shoulder for the reception of the trunnion-ring. The double coil has a shoulder at its rear end to overlap the trunnion-ring which covers the joint. The three parts are then welded together. The front of the double coil is recessed to overlap the B tube, which is first shrunk on, then the breech-coil. The cascabel is screwed in and splined. The 9-inch guns and upwards have two double coils on the breech instead of one triple coil. The higher calibres have an intermediate B coil.

In the 80-ton gun there is a 2 B coil between the 1 B coil and the B tube. Over the rear end of the A tube is shrunk a breech-piece made of a single bar 12 inches thick. The C coil is a double coil, and carries the trunnions.

The metal of the Whitworth gun is obtained by melting short bars of Swedish iron with a small quantity of carbonaceous matter in crucibles and casting in round ingots, which are subjected to hydraulic pressure while fluid. The smaller guns are forged solid; the large built up. The barrel is an ingot cast hollow and hammered on a mandrel; the hoops, also cast hollow, are hammered or rolled, annealed and screwed together to form tubes, which are bored with a slight taper, and forced one over the other by hydraulic pressure. In the larger guns the breech is hooped with a higher steel than the barrel. The breech-screw is made with offsets to screw into the barrel and the two adjoining hoops. The bore is approximately a twisted prism of hexagonal base, the angles rounded off, the middle part of each face coincident with the original circular bore. To facilitate loading, that portion of each half-side of the hexagonal bore of the gun on which the right half-side of the projectile bears as it goes in is removed, thus enabling it to enter with a loose fit. In leaving, it bears on the sides which have not been eased off, and the projectile issues with its axis in line with that of the piece.

In the 120-pounder the diameter across flats is 6.4 inches, across angles, 7 inches; length, 144 inches; windage in going in, .06 inch; weight, 16,660 pounds; twist, one turn in 130 inches; weight of charge, 27 pounds; projectile, 151 pounds; length of projectile, 20.5 inches; bursting charge of shell, 5 pounds. It is very accurate, has great range and penetration.

The Lancaster gun, patented in 1850, of elliptical bore and increasing twist, failed in service, the projectiles exerting a wedging action.

The first Krupp guns were made of single ingots of cast steel forged under heavy hammers, but it was found necessary to reinforce them by hoops of steel shrunk on; the 6-inch guns having one set, the 8- and 9-inch two, the 11-inch and higher calibres three.

The tube is cylindrical, eight-tenths of a calibre thick from a point over the middle of the charge

to that at which the rings terminate, thence to the muzzle conical, diminishing to $\frac{1}{2}$ calibre. The rifling is poly-grooved; the width of grooves diminishes as they approach the muzzle. The chamber is of larger diameter than the bore, its axis above that of the rifled part. The rear of the chamber is reamed out spherically, and in this recess is fitted a Broadwell ring whose exterior is also a spherical segment. A slot cut in the rear end of the tube receives the breech-block, so guided that a motion of translation in or out gives to the front face of the block a movement forward or to the rear parallel to itself; so that the block whose front, top, and bottom are plane surfaces, its rear rounded off, is, when screwed on, well supported from behind by the correspondingly inclined rear face of the slot. The motion of translation is given to the block by a screw which runs partly in a thread cut in the upper wall of the slot. The locking is effected by a screw working in a nut having rings on its exterior partially cut away, which take in scores cut in the solid mass at the rear of the slot.

The vent is through the breech-block in the axis of the bore terminating on the face-plate. Steel and chilled projectiles are used; those of steel have their points water-tempered. They were formerly coated with lead, but rotation is now given by a band of copper which encircles the projectile near its base, being forced by pressure into a groove undercut for its reception. The band serves also as a gas-check. In some projectiles there is a second band at the forward part of the cylinder, which, without entering the grooves, steadies the projectile. Krupp's system is also applied to rifled mortars.

The Vavasseur guns, excepting the trunnions, are of mild cast steel.

Upon a tube tempered in oil is shrunk a jacket extending from the breech to a short distance forward of the trunnions and the chase-hoops. The trunnion-band and the forward and rear hoops, in short lengths of from 6 to 8 inches, are shrunk on. The rifling on the rib system is a modification of that proposed by Lynall Thomas. The projectile has 3 corresponding grooves. The twist 1 turn in 30 calibres for all calibres. A breech-plug screwed into the rear end of the jacket supports the tube. The vent is two-fifths of the length of the cartridge from the bottom of the bore.

In the 9-inch gun two series of hoops are shrunk upon the jacket. In the 12-inch the hoops are first shrunk one over the other, forming a compound hoop, which is then shrunk upon the gun.

Breech-loading cast-iron guns, hooped with steel, were introduced into the French navy about 1860. In 1871 the system in use was adopted: calibres, 5.46 inches, 7.32 inches, 9.36 inches, and 12.48 inches.

The guns of gray iron, 2d fusion, are cast hollow, chase down, and cooled from within first with air, then water. A tube of Bessemer steel, forged and tempered in oil, has welded on its rear end a collar which screws into the cast iron, and inside of which is the thread for the breech-screw. The casting is shrunk upon the tube, which does not extend the whole length of the bore, and there is difficulty in making the joint tight. Hoops of mild steel, upon one of which the trunnions are forged, are shrunk upon the gun. The large calibres have two series of hoops, breaking joints. The Broadwell ring and the slotted screw-plug are employed. An annular space about the breech-plug in rear of the gas-check, formed by the suppression of both threads of the screws for a length of about half a calibre, which was provided to receive residuum, has also the important effect of transferring the longitudinal pressure to a point somewhat removed from that part of the gun which is subjected to radial pressures.

The screw is turned with the aid of a crank, and retained by a catch when the breech is closed. On withdrawal the plug slides on to a covered bracket, hinged to the right side of the breech, on which it is swung around, leaving the breech clear. A bronze bearer hinged to the left side of the breech facilitates loading.

To utilize the heavy cast-iron guns made before the development of the power of the rifle, several methods have been proposed and successfully applied.

Parson's System of Conversion.—A steel tube with jacket of steel shrunk on the breech part, the whole inserted under pressure from rear of iron casting. A steel plug is screwed into the steel jacket against the rear of the tube, the breech being closed by a cast-iron screw-plug.

Palliser System.—A coiled wrought-iron tube consisting of two thin bands, the outer shorter than the inner one, upon breech end of which it is shrunk. The tube is closed by a solid wrought-iron breech-screw. The tube and the bore of the gun are slightly tapered. The tube is retained in place by a screw locking-ring at the muzzle, and by a screw through the cast iron just forward of the trunnions. Full and concise descriptions of these various systems of construction, in connection with the principles involved, are given in Cooke's "Naval Ordnance and Gunnery," a standard work.

Rifle projectiles, generally cylindro-conoidal in form, designed to penetrate armor, are of tempered steel, or of cast iron with chilled heads. The shells without fuzes, the shock of impact igniting the charge.

The different methods of imparting rotation to the projectile may be classified as follows:

1st. By knobs (studs) or flanges of greater or less length, of soft metal, rigidly attached and guided by the riflings, by ribs in the bore, and corresponding grooves in the projectile.

In bores not of circular section, by giving the projectile a corresponding cross-section, as in the Lancaster and Whitworth systems.

2d. By the expansion into the grooves of a portion of the projectile, or of an attached cup, ring, or rings of copper or composition, by lateral pressure of the gases, accompanied in less degree by lateral extension of the mass under compression between the gases and rounded base of the projectile; or by the compression of metal of such plastic nature as lead, either as a cylindrical mass attached to the rounded base of the projectile, or as a ring about its middle part compressed between a shoulder in front and the forward part of a hard metal cap driven by the gases over the reduced cylindrical rear part of the projectile, as in the Hotchkiss system.

3d. By the compression of enveloping coats or rings of soft metal, lead, copper, etc., larger than the bore, through which the projectile is forced. The rings are sometimes undercut to obtain radial

pressures and quick gas-check action. This system is employed only with breech-loaders.

The knob of lead was employed in England in 1774 by Dr. Linn and Capt. Blair.

Wahrendorf, before 1843, applied lead coatings to spherical shot, and in 1851 to cylindro-conic projectiles, the lead being maintained in place by grooves in the surface of the projectile around the cylinder, and others in the direction of the riflings. Subsequently he substituted three rings of lead; the forward ring being generally torn, he added a fourth of the same diameter as the bore, to insure coincidence of axes.

Cavalli employed iron projectiles with two flanges or wings inclined to suit the grooves, and two others at the junction of the cylindrical and conical parts to steady the projectile in the bore; their windage .015 inch.

Experiments in France and Belgium led to increasing the number of grooves and the substitution of pairs of buttons for the flanges. In 1855, in England, Mr. Bashley Britten and Mr. Lynall Thomas each took out patents for a conical cast-iron projectile having attached to it, in the rear, a hollow belt of lead or other soft metal.

Mr. Jeffery about the same time produced a projectile for cannon much on the plan of a Minié bullet for small-arms. Mr. Hadden, from a gun with 3 circular grooves, fired a non-expanding projectile cast with studs corresponding to the grooves. Commander Scott, of the royal navy, recommended one with ribs or "wings," with long bearings. Various modes of rifling were exhibited. Various modifications of grooves, broad and shallow, angular and deep; and in one, rotation was imparted by ribs which fitted into corresponding grooves in the projectile. Armstrong employed lead coatings for his breech-loaders.

In the United States, Dr. Reed, of Alabama, attached a cupped ring of wrought iron to the rear part of an elongated projectile, the metal cast upon it. Its diameter was the same as that of the projectile; its exterior cylindrical. It took the grooves, but the cast iron of the projectile was spalled off by the pressure of the face of the imbedded ring. The cup was then made with an entire bottom, with several holes bored through it to permit the passage of the molten metal. The exterior opposing edges of the wrought and cast iron were beveled off.

The cups were punched by machinery out of a piece of sheet-iron, and finally assumed the form of a thin conoidal segment, with its forward end imbedded in the base of the shell at some distance from the exterior of the cylinder. This obviated the necessity of beveling the rear edge of the projectile, but the imbedded part, lying in a plane of weakness, rendered its employment dangerous in large guns, although successfully employed in small field-pieces.

Early in the war of 1861–65 there appeared in the Confederate States a bronze or copper sabot in the form of a comparatively thick spherical segment secured by a central screw, and held firmly by three projections from the convex face of the plate, extending into holes in the face of the projectile, or by three projections from the projectile extending through the plate. The pressure of the gases flattens the plate, increasing its diameter, and thus causing it to take the grooves. It was called the "Tennessee" sabot, the name of its designer being unknown, and it was applied by army and navy to projectiles for heavy guns.

In the latter part of 1862, when, in consequence of the dearth of steel, solid projectiles for navy rifled guns were forged of wrought iron, an annular groove was turned in the base of each, forming a lip, which was found to take the groove as does a Minié bullet, and to cut off the escape of gas. Some of the 8-inch bolts having been made of bars welded longitudinally, it was thought they might split in the bore of the gun. To obviate this the ratchet-sabot was devised. It consists of a cupped bronze or copper plate, with a thin cylindrical lip, which, like that of the bolt, takes the grooves, and cuts off the escape of the gas. The name "ratchet-sabot" simply indicates the mode of attachment. The base of the projectile is divided into several equal sectors, usually seven, their surfaces so inclined to its axis as to form seven oblique radial depressions, each bounded on the right by a shoulder, increasing in depth with the distance from the axis. The shoulder is made slightly concave.

The sabot of corresponding form, cast to fit, and in close contact, is secured by a central screw, one screw being sufficient for 8-inch projectiles. Trial having shown its superior efficiency it was adopted for all cast-iron projectiles employed in the Confederate navy. The first made were heavy, but experiment having shown that the weight could be advantageously reduced, they were subsequently made much lighter. Descriptions and accurate drawings of nearly all the rifled projectiles used by the armies in Virginia are given in "Professional Paper No. 14, Corps of Engineers," by Gen. H. L. Abbot, U. S. army.

By experiments made at Charleston, in October, 1863, with a 12¾-inch Blakely rifle, fired with charges of from 30 to 55 pounds of powder placed in front of a chamber 26 inches long and 6.2 inches in diameter, and by experiments made at Augusta Arsenal, in March, 1864, by a board of artillery officers, "the fact was clearly established that the common opinion as to the danger incurred on the displacement of the projectile from the charge is without sufficient foundation; that the maximum strain on the gun is experienced when the projectile is closely rammed home on the charge, the latter being packed and fitting the bore; that as the projectile is removed from the charge towards the muzzle the strain decreases, and is at its lowest point when it is at or near the muzzle itself."

This important discovery directed attention to the utility of the "air-space" as a means of diminishing initial pressure with increased charges, by which, when applied in bores of length sufficient to afford time for the action of a sustained impulsive force, extraordinary initial velocities have been obtained. In recent experiments at Shoeburyness (May, 1880) with an 8-inch rifle, charge 90 pounds of powder, and shell of 184 pounds, a velocity of 2300 feet was given. With a shell of new form a velocity of 3000 feet is said to have been obtained. The employment of enlarged chambers is now general.

Under the direction of the Bureau of Ordnance, 100-pounder and 60-pounder Parrott guns have been tubed and converted into 6.4-inch and 5.3-inch breech-loaders on the French system; 11-inch Dahlgren guns into muzzle-loading rifles,

adding 25 per cent. to the power of the gun at the muzzle and doubling it at 1000 yards. Similar conversions of columbiads have been made, and also applications of Krupp's system of fermature. Several rifles of large calibre, designed in accordance with indications afforded by the most recent developments abroad and in this country, are to be constructed.

In 1880, Col. T. T. S. Laidley, Ordnance Department, U.S.A., made some experiments on the resistance of cast-iron, thick, hollow, cylinders, lined with tubes of different thickness of metals, to an interior pressure. The cast iron was a cold-blast, charcoal-iron having a tensile strength of 30,000 pounds per square inch, and great extensibility. The cylinders were all cast from the same furnace of metal, and were 22 inches in length and 11 inches in diameter. They were bored out to a diameter of 3.5, 4.3, and 5.1 inches respectively, leaving a solid breech of 5.5 inches, except two of the first series, which were bored through, and the breech closed with a screw-plug 5.5 inches long. Three of the cylinders were lined with copper tubes 0.1 inch thick, two with brass tubes .5 inch thick, and three with coiled wrought-iron (Ulster) tubes, .9 inch thick, leaving the bores 3.3 inches in diameter. The bores were filled with beeswax to a depth of 10 inches; a copper ring similar to the Broadwell gas-check placed on the beeswax, and a steel piston on top of it. The base of the cylinder rested against the beam of the testing-machine, and the piston was forced in till the cylinders were burst. The bursting strains were in direct proportion to the area of cast iron in the longitudinal section through the axis.

No. 2 took a permanent enlargement of the bore of 0.187 inch, and an increase of 0.078 inch in the diameter of the exterior, without breaking or showing any sign of a crack.

Dimensions of Cylinders and Bursting Strains.

Lining.		Thickness of Cast-Iron Walls.	Bursting Strain.
Kind of.	Thickness.		
	Inches.	*Inches.*	*Pounds.*
Copper...........	0.1	3.746	792,500
Copper..........	0.1	3.746	769,200*
Copper..........	0 1	3.746	737,600
Bronze..........	0.5	3.343	635,500
Bronze..........	0.5	3.347	687,900
Wrought iron	0.9	2.945	660,200
Wrought iron	0.9	2.945	735,400
Wrought iron	0.9	2.943	698,100

While foreign states, recognizing the superiority of the rifle, have augmented the power of their armaments, the United States have deferred action until costly experiments and competitive trials abroad have developed all that is necessary to be known in order to construct ordnance of a permanent character.

A point has now been reached from which a just departure may be taken, and it only remains for the government, in making the necessary appropriations, to give the ordnance of this country a relative efficiency not less than it possessed before the advent of the breech-loading rifle.—*J. M. Brooke.*

* Diameter of bore of lining, 3.4 inches; the others, 3.3 inches.

Ordnance-hoy. A hulk expressly fitted for transporting ordnance stores.

Organization. The navy is organized as a department under the Executive of the nation. The President is by the Constitution the commander-in-chief of the navy. He is represented by a Secretary, who is an officer of the Cabinet. To aid the Secretary in carrying out his duties the business of the Department is divided under eight permanent bureaus. Each bureau is presided over by an officer of the navy, who, if below the grade of commodore, is given that grade or its relative rank whilst in office.

The bureaus are those of:

Ordnance.—Charged with the administration of everything pertaining to the armament of ships, including the experimental battery at Annapolis, torpedo school at Newport, and nitre beds at Malden. This bureau is represented on shore, at dock-yards and manufactories, by inspectors and assistant inspectors of ordnance, and at sea by the ordnance-officers and gunners of ships.

Equipment and Recruiting.—Charged with the canvas, rigging, and general equipment of ships, including coals and wood. The enlistment, service, discharge, re-enlistment, burial, and organization of the men, including the apprentice system, and receiving-ships or barracks. This bureau is represented on shore, at dock-yards by the equipment-officer, by the commanding and executive officers of receiving-ships or barracks, by the officers detailed for recruiting duty, and by such officers as may be appointed as special inspectors of equipment; at sea by the equipment-officers of ships, the boatswains and sailmakers.

Navigation.—Charged with the administration of everything pertaining to the navigation of ships, including the Hydrographic Office, Signal Office, Naval Observatory, Nautical Almanac Office, and Office of Detail, from which orders are issued to officers for service and in which the officers' rolls are kept. At dock-yards this bureau is represented by the navigation-officer, and at sea by the navigating officers of ships. Scientific expeditions are usually under its direction.

Yards and Docks.—Charged with the administration of everything connected with buildings, wharves, docks, streets, railways, and such other government property of a permanent nature as may be at any of the naval stations. In addition to the foregoing, this bureau is charged with the direction of the Naval Asylum, and, at navy-yards, is represented by the civil engineers.

Medicine and Surgery.—Charged with the administration of everything connected with the hygiene and surgery of the service, including the naval hospitals, sick quarters, and naval laboratory. This bureau is represented on service by the officers of the medical corps.

Provisions and Clothing.—Charged with the provisioning and clothing of the navy. This bureau is represented by the officers of the pay corps, who are besides charged with the care of all funds which may be placed in their hands by the Treasury Department for the use of the navy, accounting for the same to the Second Comptroller, and Fourth Auditor of that Department.

Steam Engineering.—Charged with the administration of everything connected with the steam machinery of ships. This bureau is represented

on shore and afloat by the officers of the engineer corps.

Construction and Repair.—Charged with the construction and repair of the hulls, decks, bulkheads, spars, and boats of vessels. This bureau is represented at dock-yards by naval constructors, and at sea by the executive-officers and carpenters of ships.

The office of judge-advocate-general is to be charged with the administration of naval justice. See JUDGE-ADVOCATE-GENERAL.

The Secretary is assisted in his legal decisions by an officer detailed from the Attorney-General's Office, and in his pecuniary ones by the Second Comptroller of the Treasury.

The shore stations, consisting of the navy-yards at Portsmouth, N. H., Boston, Mass., New York, N. Y., League Island, Pa., Washington, D. C., Norfolk, Va., Pensacola, Fla., and Mare Island, Cal., and the Naval Academy at Annapolis, Md., are commanded by officers detailed as commandants, who are directly responsible to the Secretary of the Navy. All the bureaus are represented at the yards as has been stated. There are besides the naval stations at New London and Port Royal.

The marine corps is commanded by a colonel commandant. This officer commands the marines, and has charge of their detailing for sea-service, quartering, commissariat, clothing, and pay, being assisted by officers of the corps. He has entire control of the marine barracks at Washington, D. C., and controls those at the naval station under the commandants of the yards.

Many officers of the navy are detailed for duty under the Treasury Department, occupying positions in the Light-House and Coast Survey Departments.

The officers of the navy are divided among the line, and the medical, pay, engineer, and construction corps. There are besides chaplains, professors, civil engineers, and the officers of the marine corps.

The cruising navy is divided into five squadrons, each commanded by a flag-officer, who hoists his flag on board one of the vessels of his squadron.

Each flag-officer has certain officers detailed to act as his personal staff, accompanying him in case he shifts his flag. There are two lieutenants who act as flag-lieutenant and secretary, and several lieutenants and junior officers as aids; the number and rank depending on the size of the squadron.

The general staff, who also perform duty as officers of the flag-ship in small squadrons in peace-time, are a chief-of-staff (commanding officer), a fleet-surgeon, a fleet-paymaster, a fleet-engineer, and a fleet marine officer. In war-time the general staff would always accompany the flag-officer.

The organization of a ship of war is as follows:

A commanding officer, who is responsible for and commands the ship and everything in her.

An aid or executive to the commanding officer, who assists him in his duties, and takes special charge of everything belonging to the Bureaus of Equipment and Recruiting, and Construction.

A navigator, who assists the commanding officer in navigating the ship, and takes special charge of everything belonging to the Bureaus of Navigation and Ordnance.

Watch- and division-officers, who carry on the routine of the ship, representing the commanding officer, in turn, on the deck of the ship.

Officers of the forecastle and midshipmen of the watch, who assist the watch-officers in all their duties.

Assistant navigators, who assist the navigator.

Aid to the commanding officer.

Mates of decks, holds, and hull, who have charge, under the executive- and watch-officers, of the parts of the ship named.

A medical officer and one or more assistants, who attend to the sick and wounded.

An engineer and assistants, who have charge of the engines and boilers.

A paymaster, assisted by a clerk, who has charge of the clothing and provisions in store, issuing them on requisition. He also pays the officers and men, and has charge of the disbursement of the moneys expended by the representatives of the different bureaus.

A marine officer, who commands the marine-guard.

A chaplain.

A gunner, a boatswain, a sailmaker, and a carpenter also form part of the complement of large ships.

The organization of the crew is based on the necessities of the ship when under sail and steam, slightly modified in vessels of peculiar rig to suit the requirements of the battery.—*Theodore B. M. Mason, Lieutenant U.S.N.*

Organization, when referred to in works on seamanship, relates to the organization of a ship's company. The duties of officers on board ship are clearly defined by regulations. But the crew, composed of able seamen, ordinary seamen, landsmen, and boys, many of them utter strangers to one another and to the officers, of some foreigners, of merchant-sailors unaccustomed to the routine of a ship-of-war, of others again totally ignorant of a ship of any kind, forms altogether a motley crowd which must be "sorted out," as it were, and the work of the ship, as a powerful engine of war, so distributed among them that, each one acting the part assigned him, the daily routine may be performed efficiently and expeditiously. The organization and the routine, together with the drills and exercises which form their principal feature, all have for their ultimate object a state of preparation for immediate battle.

The first step is the selection of a good corps of petty officers,—boatswain's mates, quartermasters, quarter-gunners, coxswains, captains of the five "parts of the ship" (forecastle, fore-, main-, and mizzen-tops, and after-guard), captain of the holds, etc. Next come the able seamen, who are selected according to their age and build, for the forecastle and tops, the younger and lighter being stationed aloft. The ordinary seamen are mostly stationed aloft, while the landsmen and boys are distributed nearly equally among the different parts of the ship, with the exception of the after-guard, where the landsmen are in excess. The petty officers being culled out, we next proceed to make out the watch-bill, which forms the basis of the organization. The entire crew is divided into two watches,—starboard and port,—taking care in doing so that the

intelligence and physical force shall be equally distributed between the two. Each member of the crew has his watch number, the odd numbers belonging to the starboard watch, the even to the port. Thus, beginning with the forward part of the ship, the captain of the starboard watch of forecastle is No. 1 on the watch-bill; the captain of the port watch of forecastle No. 2, and so on through the ship's company. Each watch is divided into two equal parts, called respectively *first* and *second* parts, each part being headed by a captain. Thus we have the second captain of the starboard watch of forecastle in charge of the second part of starboard watch of forecastle-men, and so on for each part. These subdivisions are called *quarter-watches*. Having completed the watch-bill, we next fill out the quarter-bill,—*i.e.*, station the crew at the guns and in the different parts of the ship, with a view to battle. The guns' crews for the odd-numbered guns are selected from the starboard watch (referring to ships carrying their batteries in broadside); the first part of the gun's crew, when preparing for battle, casting loose and providing the starboard gun of the pair, the second part the port. The port watch man the even-numbered guns, the first part of each gun's crew casting loose and providing the port gun of the pair, the second part the starboard. One-half of each gun's crew are *riflemen*, provided with the most approved pattern of rifles, and one-half are *boarders*, provided with cutlasses and pistols. There are also *wreck-clearers*, who, when called upon, leave their guns and assist in the management of the ship; and *firemen and pumpmen*, whose duties are suggested by the names. In addition to the gun divisions, there are the powder division, for supplying ammunition, the navigator's division (under which come the steering of the ship, the handling of sails, spars, and rigging, the repairing of damages, etc.), the engineer's division, and the surgeon's division. The marines form a division by themselves. The fire-bill is the next consideration, after which bills for *getting under way*, *anchoring*, *loosing and furling sail*, *bending sail*, *tacking and wearing*, *reefing*, *up and down topgallant and royal yards*, *mooring and unmooring*, etc., to which it has been customary of late to add *clearing ship for action*, *man overboard*, *abandoning ship*, *cutting-out expedition*, and *disembarking small-arms men and marines*. For the latter purpose the guns' crews are formed into companies, and the latter into a battalion when admissible. The station-bills are so arranged that any given evolution or manœuvre may be performed by either watch. By the use of skeleton station-bills much of the labor of organization may be accomplished before the crew is received on board. In addition to the foregoing, every boat in the ship must have its own coxswain and crew,—a crew being detailed from each watch at sea for the life-boat,—and each member of the ship's company be assigned to a mess. There are also howitzer crews, and crews for Gatling-guns.

When it becomes a question of organizing a crew of 700 or 800 men, all to be kept within the limits of one ship, and all to work together harmoniously and effectively, and to be kept constantly well in hand, the labor calls forth the very highest qualities an officer can possess. The training system, now happily inaugurated, by which American boys are specially trained for men-of-war's men, will, in time, materially lighten the labors of an executive-officer, upon whom the duties of organization chiefly devolve. —*S. B. Luce, Captain U.S.N.*

Organling. A kind of fish; orgeis.

Orgeis. A certain fish, supposed to be so called from the Orkneys, on the coast of which it is taken.

Orion (the mythical lover of Diana). The most brilliant constellation of the heavens, figured as a man with club and lion's skin. The stars α, β, γ, κ are in the form of a great quadrilateral; α at the northeast angle being in the right shoulder of Orion, and the nearest to the Twins; β at the opposite angle in the left foot; γ is in the left shoulder, and κ is in the right leg. In the middle of the quadrilateral are three stars of about the second magnitude, δ, ϵ, ζ, disposed in an oblique line; these form the belt of Orion, from which depend a luminous train of small stars called the sword. This constellation is surrounded by a series of the most conspicuous stars in the heavens, Aldebaran, Capella, Castor and Pollux, Procyon, Sirius, and Canopus. α *Orionis*, Betelguese, or Betelguex. β *Orionis*, Rigel. γ *Orionis*, Bellatrix.

Orlop. The lowest deck, formerly called "over-lop," consisting of a platform laid over the beams in the hold of ships of war, whereon the cables are usually coiled, and containing a few state-rooms as well as the chief store-rooms. In trading-vessels it is often a temporary deck.

ORLOP-BEAMS. The beams which support the orlop-deck, but are chiefly intended to fortify the hold.

Ornaments. The carvings of the head, stern, and quarters of the old ships.

Ornithæ. An ancient term for the periodical winds by which migratory birds were transported.

Orrery. A machine which exhibits the motion of the heavenly bodies on their orbits.

Orthographic Projection. The orthographic projection of the sphere is a natural projection made by straight lines at right angles to the primitive or plane of projection. The eye is conceived to be infinitely distant from the sphere, so that the visual rays are parallel to one another, and a diametral plane is chosen for the primitive. See PROJECTION.

Osaka, the principal city in industry and commerce of Japan, is situated on the island of Hondo. It has a large foreign trade, and ships large amounts of tea, silk, silk-worms' eggs, and copper. It has a steam paper-mill, arsenals, machine-shops, and is a great centre of native manufactures. Pop. 282,000.

Oscillating-cylinder Engine (*Oscillating-engine*). One in which the cylinder is supported, about midway, by hollow axles, called trunnions, and on which it oscillates to allow the piston-rod, which is connected directly to the crank-pin, to accommodate itself to the motion of the crank, thus dispensing with the connecting-rod; the steam enters through one trunnion to the steam-chest and is exhausted through the other.

Oscillating-piston Engine. One in which the piston, rectangular in form, oscillates on one side, like a door on a hinge; the piston-shaft which acts as the hinge, extends beyond the steam-chamber, and by means of a reciprocating

arm and connecting-rod to the crank-pin gives motion to the propeller shaft.

Oscillating-valve Engine. One the main steam-valves of which are cylindrical in form, and act by partial rotation within a cylindrical seat; the valves are hollow and have parts which, by the oscillating motion, are alternately opened and closed to other parts in the seat which lead to the steam-cylinder.

Osmond. The old term for pig-iron.

Osnaburg. In commerce, a coarse linen cloth manufactured in Scotland, but resembling that made at Osnaburg, in Germany.

Osprey. The fish-hawk, *Pandion haliœtus.*

Os Sepiæ. The commercial term for the sepia, or cuttle-fish bones.

Ostend. A seaport town of Belgium, in West Flanders, on the North Sea, in lat. 51° 14′ 1″ N., lon. 2° 55′ 5″ E. It has a large harbor, docks, piers, and basins, rope-walks, and building docks, a large trade in agricultural products, and regular steam communication with London and Dover. Pop. 17,000.

Ostracion. A genus of rough-skinned fishes having the body covered with an armor of solid, immovable, long plates, the tail, fins, etc., passing, as it were, through holes in the coat of mail; trunk-fish.

Oswego is situated on Lake Ontario, at the mouth of the Oswego River, in Oswego County, N. Y., in lat. 43° 28′ N., lon. 76° 35′ W. It is the most populous city on Lake Ontario, except Toronto, Canada. It has a good harbor, sheltered by long and costly piers, and defended by Fort Ontario. Great quantities of grain, lumber, etc., are received here, part of which is transshipped through the Oswego Canal and by the various railroads centring here. The city contains a great many flour-mills, several iron-foundries, machine-shops, ship-yards, and a large corn-starch manufactory. Pop. 23,000.

Otary (*Otaridœ*). A family of the seal tribe (*Puocidœ*), distinguished from the other members of the family by a projecting auricle or auditory conch, and by the four middle incisors having a double cutting edge. The membrane which unites the toes of the hind feet is prolonged into a flap beyond each toe. The fore legs are placed farther back than in the true seals, giving the otaries the appearance of having a longer neck. The hind legs bear a closer resemblance to the fore legs than in the true seals. See SEA-LION.

Otter-pike. The lesser weever, *Trachinus draco;* also called *sea-stranger.*

Ottomites. An old term for Turks.

Out-and-outer. An old phrase signifying thorough excellence; a man up to his duty, and able to perform it in style.

Out-board. Outside the ship. Farther from the keel.

Outer-jib. See JIB, OUTER.

Outfit. The stores and equipments with which a ship or boat is provided. The wearing apparel of an individual.

Outhaul. A rope for hauling out the clew of a boom-sail or the tack of a lower stun'sail.

Outlandish. Foreign; but means with Jack a place where he does not feel at home, or a language which he does not understand.

Outlying. Beyond the coast; as, outlying rocks.

Out-pensioners (*Eng.*). Those entitled to pensions from Greenwich Hospital, but not admitted to "the house."

Out-ports. Those commercial harbors which lie on the coast.

Outregans. Canals or ditches navigable by boats.

Outrigger. A counterpoising log of wood thrust out to windward from the side of a canoe to prevent capsizing. Any spar thrust out to give a lead to a purchase, or to extend a sail.

Outwards. A vessel is said to be entered outwards or inwards according as she is entered at the custom-house to depart for, or as having arrived from, a foreign port.

OUTWARD CHARGES. Pilotage and other dues incurred from any port; the reverse of *inward charges.*

Ouvre L'Œil. A mark on French charts over supposed dangers.

Over-anent. Opposite to.

Overbear. One ship *overbears* another if she can carry more sail in a fresh wind.

Over-boyed. Said of a ship when the commissioned officers are very young.

Overfall. A rippling or race in the sea, where, by the peculiarities of the bottom, the water is propelled with immense force, especially when the wind and tide, or current, set strongly together. See RIPS.

Over-gunned. Said of a vessel rendered inefficient by carrying too many guns, or guns of too great weight.

Overhang. The part of a deck or bow which projects over the main body of the vessel.

Overhaul. To examine; to inspect. To gain upon in a race or chase. To separate the blocks of a tackle by lighting the falls through.

Over-heating Pipe. A pipe used as a superheater for converting saturated steam into superheated or dry steam.

Overlay Days. Days for which demurrage can be charged.

Over-loft. An old term for the upper deck of a ship.

Over-masted. The state of a ship whose masts are too high or too heavy for her weight to counterbalance.

Over-press. To carry too much sail on a ship.

Over-rake. When waves frequently break in upon a vessel riding at anchor in a head-sea, they are said to *over-rake* her.

Over-rigged. A ship with more and heavier gear than necessary.

Over-risen. A ship too high out of the water for her length and breadth, so as to make a trouble of lee-lurches and weather-rolls.

Over-running. Applied to ice, when the young ice overlaps, and is driven over.

Over-sea Vessels. Ships from beyond the sea, as distinguished from coasters.

Overslaugh. A bar in a river. To bar the promotion of; to ignore an officer's claims to any particular duty or privilege.

Over-swack. An old word signifying the reflux of the waves by the force of the wind.

Owler. An old term for a smuggler. A person who keeps late hours.

Oxbows. Bends or reaches of a river.

Ox-eye. A small cloud, or weather-gall, seen on the coast of Africa, which presages a severe storm. It appears at first in the form of an ox-eye, but soon overspreads the whole sky,

accompanied by a violent wind, which scatters chips in all directions, and many are sunk downright. Also, a water-fowl.

Oxyrhincus. A large species of the skate family.

Oyster (Lat. *Ostrea*). This name is generally understood to signify the species of Ostracean bivalve called *Ostrea edulis*, which is one of a numerous genus characterized by an inequivalve shell, composed of two irregular lamellated valves, of which the convex or under one adheres to rocks, piles, or to the shell of another individual of the species. The animal has neither a byssus nor a foot; it is the best flavored of its class and has, consequently, been always much esteemed. Vast beds of oysters are artificially formed and attended to with great care in many localities. Oysters formed a great luxury among the Romans, and, as is customary now, were served at the commencement of a repast. The various States of the Union in the waters of which oysters abound have regulated by law the time of taking and exposing them for sale. The trade in oysters has grown to enormous dimensions in the United States, aggregating many millions of dollars in value annually.

Oyster-catcher, or Sea-pye. The black and white coast-bird, *Hœmatopus ostralegus.*

P.

P. In the log-book, *p* denotes *passing showers.*

Pacific. The name given by Magellan, the first European who traversed it, to the ocean which extends between America on the east and Asia and Australia on the west, in consequence of his enjoying fair weather on entering it, having previously experienced tempestuous gales in the strait which bears his name. The Pacific is the greatest expanse of water on the globe. See OCEANS.

Pacific-iron. An iron at the end of a yard, over which is shipped the boom-iron for the stun'sail boom.

Pack-ice. A large collection of broken floe huddled together, but constantly varying its position; said to be *open* when the fragments do not touch, and *close* when the pieces are in contact.

Packing. Metallic rings, braided hemp, cotton, or wire, and various preparations of rubber, canvas, asbestos, plumbago, etc., used to make steam- and water-tight joints around piston-rods, valve-stems, and between flanges; also for slip-joints of long pipes.

PACKING-BOX. The chamber around a piston-rod, valve-stem, etc., to receive the packing; a stuffing-box.

PACKING-RINGS. Metallic rings surrounding steam- or water-pistons which expand against the side of the cylinder and prevent leakage. In the ordinary steam-piston there are three: two narrow ones surround a third, equal in width to the other two. These rings are turned up larger in diameter than the space they are to occupy, and a piece is cut from their circumference, which permits them to be sprung into place, and their elasticity, aided by springs, causes them to press tightly against the surface of the cylinder.

Pad. A package of some soft material like oakum, or sail-cloth, or both combined, and used to prevent wear when two bodies are chafing each other; a fender made of soft material.

Paddle. A wooden implement, shorter and broader than an oar, used in propelling a boat. It is managed with both hands without a row-lock, and is held vertically. The float of a paddle-wheel.

PADDLE-BEAMS. Two large beams extending out sufficiently from the sides of paddle-wheel steamers to receive the spring-beam; a frame is thus formed on which to erect the paddle-box.

PADDLE-BOX. The frame of wood which encircles the upper part of the paddle-wheel.

PADDLE-BOX BOATS. Boats made to fit the paddle-box rim, stowed bottom upwards on each box.

PADDLE-WHEEL. A wheel with paddles or floats on the periphery, used for propelling vessels. There are two principal kinds, the *radial* and the *feathering* wheel. In the former the paddles are fixed; in the latter, by a system of mechanism they are made to pass through the water in nearly a vertical position. The first use of steam in the propulsion of vessels of which we have knowledge is that said to have been made by Blaco de Garay, in 1543, in a vessel of 200 tons burden, in the port of Barcelona, Spain. In 1588, Ramelli designed a paddle-wheel, flat-bottomed boat, worked by men turning a crank. Before the year 1700 more than a dozen patents were taken out in Europe having for their object the propulsion of boats by wheels, including one by the Marquis of Worcester. In 1682 a tow-boat was used at Chatham, the wheels being turned by horse-power. In 1729, Dr. John Allen obtained a patent in England for propelling a vessel by forcing water through the stern.

In 1787, Patrick Miller, of Dalswinton, England, published a pamphlet describing a vessel propelled by paddle-wheels, designed to be worked by a steam-engine. In 1789, Miller built a boat 25 feet long by 7 feet beam, worked by a double engine having 18-inch cylinders, and with it made 7 miles an hour on the Forth and Clyde Canal. This boat was engined by Symington.

In 1784, James Ramsay, an American, obtained a patent for an invention designed to work oars by steam. Two years later he had patented an application of steam to the paddle-wheels of vessels, and in 1787 built a vessel 60 feet long by 12 feet beam, with an engine having a 12-inch cylinder. This vessel made a speed of 7 miles an hour. In 1790 he built another boat, which made regular passage on the Delaware River.

In 1797 an experiment took place near Liverpool on oars worked by steam, the engine making 18 strokes per minute.

In 1801, Lord Dundas employed Symington to fit up a steamboat for the Forth and Clyde Canal Company. This boat, completed in March, 1802, was called the "Charlotte Dundas," and made the trip between Port Dundas and Glasgow, a distance of 19½ miles, in 3½ hours.

John C. Stevens and Oliver Evans both experimented in the same direction, but it was left for Robert Fulton to practically establish the feasibility of steam navigation. His first attempt was made in France, in 1803, by the aid of Mr. Robert R. Livingston, but this was not successful.

In 1807, Fulton built his first boat in America, which was launched on the East River, at New York, and an English engine was fitted on board. This boat, named the "Clermont," was 130 feet long by 18 feet beam, and 7 feet depth. She started on her trial-trip from New York to Clermont, and thence to Albany, August 7, 1807. The whole distance of 110 miles was made in 24 hours. She created the utmost astonishment and even dismay along the shores of the Hudson.

The first steamer to cross the Atlantic was the "Savannah," which made the passage in 1819. Her paddle-wheels were made to take to pieces in bad weather.

Paddy, or Padi. Rice in the husk, so called by the Malays, from whose language the word has found its way to all the coasts of India.

PADDY-BOAT. A peculiar Ceylon boat.

Paddy's Hurricane. Not wind enough to float the pennant.

Padrone, or Patron. The master of a small coaster in the Mediterranean.

Paduan. A small Malay vessel armed with two guns, one aft and the other forward, for piratical purposes.

Pahi. The large war-canoe of the Society Islands.

Painter. A rope attached to the bows of a boat, used for making her fast; it is spliced with a thimble to a ring-bolt inside the stem.

Paixhan-gun. Introduced by the French Gen. Paixhan about 1830, for the horizontal firing of heavy shells, having much greater calibre, but proportionately less metal, than the then current solid-shot guns.

Palæoniscus. A genus of ganoid fishes, with a fusiform body, covered with rhomboid scales, a heterocercal tail, and moderately-sized fins, each furnished with an anterior spine. The single dorsal fin is opposite to the interval between the anal and ventral fins. Twenty-eight species have been described from the Carboniferous and Permian measures.

Palaver. Flattery; blarney; idle talk.

Palermo, the capital of Sicily, has its port on the north side of the island. The town is built in the form of an amphitheatre, facing the sea, and is surrounded by an old wall. Adjoining the water is Fort Castellamare. The principal buildings are the royal palace, the observatory, armory, mint, custom-house, and public library. The port is inclosed by a mole 1300 feet in length, terminated by a light-house and battery. A second interior port is reserved for the marine. Palermo is the residence of the military commandant of the island, and has an arsenal and ship-building yards. The principal articles of export are sumac, wine, and spirits, fruits, sulphur, skins, oil, essences, etc. The fisheries of the coast are also very productive. Lat. 38° 8′ 2″ N.; lon. 13° 22′ 2″ E. Pop. 230,000.

Palinurus. The steersman of the vessel of Æneas, drowned, according to Virgil, off the coast of Italy, and afterward met with by the Trojan hero in the shades. A promontory on the coast received his name.

Pallet. A ballast-locker formerly used to give room in the hold for other stowage.

Palleting. A light platform above the bottom of the magazines to keep the powder from moisture.

Palliobranchiates (Lat. *pallium*, a mantle, and *branchia*, gills). The name of an order of acephalous mollusks, including those in which the gills are situated on the internal surface of the lobes of the mantle.

Palm. The triangular face of the fluke of an anchor. Also, a shield-thimble used in sewing canvas, rope, etc. It consists of a flat thimble to receive the head of the needle, and is fixed upon a piece of canvas or leather across the *palm* of the hand, hence the name.

Palma, in Spain, is the capital of the island of Majorca, and of the province of the Balearic Isles, in lat. 39° 34′ N., lon. 2° 45′ E., and has a fine harbor in the Bay of Palmas. Two light-houses stand at the entrance off Porti Pi, a narrow road, where the large vessels anchor. Palma is the port for the whole island, and has important coastwise, foreign, and colonial trade. The manufactures comprise cotton, linen, woolen, and silk tissues, etc. The city is surrounded by a wall 36 feet thick, with 13 bastions and 8 gates, 3 fronting the sea and 5 facing the land. Pop. 54,000.

Palmer, James C., Surgeon-General U.S.N. Born in Maryland. Appointed from Maryland, March 26, 1834; entered the service as assistant surgeon; attached to frigate "Brandywine," Pacific Squadron, 1835; sloop "Vincennes," cruise around the world, 1836; rendezvous, Baltimore, 1837; Exploring Expedition, 1838–42; navy-yard, Washington, 1842.

Commissioned as surgeon, October 27, 1841; sloop "St. Mary's," Home Squadron, 1844–46; sloop "Vandalia," Pacific Squadron, 1850–53; receiving-ship "Baltimore," 1853–56; frigate "Niagara," Cable Expedition, 1857; sloop "Macedonian," Mediterranean Squadron, 1858–60; Naval Academy, 1861–63; fleet-surgeon, flag-ship "Hartford," West Gulf Squadron, 1863–65; battle of Mobile Bay, August 5, 1864; Naval Hospital, New York, 1866–69; special duty, Newport, R. I., 1870–72; chief of Bureau of Medicine and Surgery, 1872–73. Retired June 29, 1873.

Palmipeds (Lat. *palma*, a palm, and *pes*, a foot). The name given by Cuvier and Temminck to an order of birds corresponding to the *Anseres* of Linnæus and the *Natatores*, or swimming-birds, of Illiger.

Pamban Manche, or Snake-boat. A canoe used on the numerous rivers and back-waters of Cochin China, from 30 to 60 feet long, and cut out of the solid tree. The largest are paddled by about 20 men, double-banked, and, when pressed, they will make as much as 12 miles an hour.

Pampero. A violent wind from the southwest over the immense plains or pampas of the Rio de la Plata, where it rages like a hurricane.

Panama is situated on the Gulf of Panama, on the south coast of the isthmus of the same name, and is the capital of the state of Panama, one of the United States of Colombia of South America. The most important part of the town stands on a peninsular tongue of land. The rise and fall of the tide at Panama is from 16 to 21 feet, owing to which ships lie at anchor in the harbor at some distance from the shore. The harbor is protected by numerous islets, and affords secure anchorage. The city has very little trade, and is only important as a mail station and the Pacific terminus of the Panama Railroad. Lat. 8° 57′ 13″ N.; lon. 79° 31′ 58″ W. Pop. 11,500.

Pancakes. Thin rounded spots of floating snow-ice, in the Arctic seas, and reckoned the first indication of the approach of winter, in August.

Pangaia. A vessel of East Africa, with one mat-sail of cocoa-nut leaves, the planks being pinned with wooden pins, and sewed with twine.

Pannikin. A small tin pot.

Pannyar. Kidnapping negroes on the coast of Africa.

Panshway. A fast-pulling passenger-boat used on the Hooghly.

Pantograph. An instrument to copy or reduce drawings.

Pantometer. An instrument for taking angles and elevations, and measuring distances.

Paper Boat. Paper boats are much used in racing. They are made by applying sheets of manilla, or unbleached linen, paper to a model corresponding to the form of the boat. The whole is covered with boiled linseed oil and turpentine, and afterward with shellac. The framing is then inserted. The boats are impervious to water, and weigh about two-thirds as much as a wooden boat of the same dimensions.

Paper Nautilus. A testaceous cephalopod, so called from the fragile nature of the boat-like shell in which it occasionally floats on the still seas of the warmer latitudes. See ARGONAUTA.

Par, or Parr. The samlet, brannock, or branling.

Pará, one of the principal seaport cities of Brazil, is situated on the Bay of Guajara and the right bank of Pará River. The cacao, caoutchouc, isinglass, rice, and drugs exported from Brazil are chiefly from Pará. The trade is mostly with London, Liverpool, and North American and Brazilian ports. Lat. 1° 28′ S.; lon. 48° 30′ 5″ W. Pop. 35,000.

Parachute. An umbrella-like device for propelling a sailing-vessel in a calm. It is put overboard forward, and, upon being hauled aft by a line, it expands, and the ship is urged ahead. When the forward line is hauled upon it contracts, and offers but little resistance to the water.

Parade. See KING'S PARADE.

Parahiba, a city of Brazil, is situated on the Parahiba River, near its mouth in the Atlantic. The lower part of the town is the commercial quarter, and one of its chief edifices is a fine government warehouse. The principal buildings are the governor's palace, military arsenal, and treasury. The city has a good port, and its trade is chiefly in sugar, cotton, and Brazil wood. Pop. 14,000.

Parallax. The apparent displacement or difference of position of an object, as seen from two different points of view.

PARALLAX, ANNUAL. The greatest value of the heliocentric parallax.

PARALLAX, GEOCENTRIC or DIURNAL. The direction in which a heavenly body would be seen if viewed from the centre of the earth is called its *true* place; the direction in which it is seen from any point on the surface is called its *apparent* place. The arc of the heavens, intercepted between the true and apparent places, is called the *diurnal* or *geocentric* parallax. It varies with the altitude of the object, being greatest when the altitude is 0°, and zero when the object is in the zenith.

PARALLAX, HELIOCENTRIC. The parallax of a body with reference to the sun; its measure is the angle formed by lines from the body to the centre of the earth and the centre of the sun.

PARALLAX, HORIZONTAL. The particular value of the geocentric parallax when the heavenly body is in the horizon; it is the greatest value of the geocentric parallax. It varies with the latitude of the observer, being greatest at the equator.

PARALLAX IN ALTITUDE. A term used in contradistinction to *horizontal parallax*, to signify any value of the geocentric parallax other than that which it has when the altitude is zero.

Parallel. See ALTITUDE, DECLINATION, LATITUDE.

PARALLEL-MOTION. A device invented by Watt, for connecting a piston- or pump-rod to the working-beam, in such a manner that the former must move in a right line.

PARALLEL RULER. An instrument consisting of two pieces connected by pivoted cross-pieces, in such a manner that the two pieces may be spread apart and yet retain their parallelism.

PARALLEL SAILING. When the means of determining the longitude were not so reliable as at the present day, it was a common practice first to make the parallel of the place, and then sail due east or west. Hence the importance formerly attached to parallel sailing. See NAVIGATION.

Paramaribo, the capital town of Dutch Guiana, is situated on the west bank of the Surinam, 5 miles from its mouth in the Atlantic, in lat. 5° 49′ N., lon. 55° 22′ W., and has a population of 22,000, mostly blacks. It is the centre of trade for the colony, and has an extensive trade by sea.

Paranzello. A small Mediterranean vessel, pink-sterned, with a lateen mainsail and mizzen, and a large jib.

Parbuckle. A purchase for hauling up or lowering a cask, or any cylindrical object, where there is no crane or tackle; the middle of a rope is passed round a post, the two ends are then passed under the two quarters of the cask, bringing the ends back again over it, and being both hauled or slackened together, they either raise or lower the cask, as may be required.

Parcel. To wind tarred canvas round a rope.

PARCELING. Narrow strips of old canvas daubed with tar and wound about a rope like a bandage, previous to its being served.

Parclose. A limber-hole.

Pardoning Power. The President, as commander-in-chief of the army and navy, and of the militia when called into service, possesses the supreme pardoning power. (Constitution of United States, Art. II.) By law, in certain lesser cases, this is delegated to subordinates in the military hierarchy, who can virtually pardon by the remission or mitigation of sentences imposed by courts erected by their own authority or that of an inferior.

Different conceptions of the pardoning power of the President prevail, and its exact capacity has long been a subject of dispute. The judge-advocate of the army (Holt's Digest, 3d ed., p. 260) always held that the President could not treat as a nullity, or set aside, the sentence of a competent military court on the ground that the evidence was insufficient, but only on the ground that there had been some "fatal defect" in the proceedings, making them void *ab initio*. Further, that the pardoning power cannot reach an *executed* sentence which has been regularly imposed by a competent court, although it might, when executed only in part, remit the remainder.

In strange contrast with this are two notable naval cases. Capt. Napoleon Collins and Lieut.-Commander Geo. M. Bache, U.S.N., were tried at New York, in 1868, for suffering the U. S. steamer "Sacramento" to be lost on the coast of Coromandel, and were sentenced to be suspended from duty on the retired pay of their grades (the latter for one year) and to be publicly reprimanded. The sentences were approved and promulgated in General Orders, Feb. 10, 1868, by the Hon. Gideon Welles, Secretary of the Navy. Thirteen months later, March 11, 1869, the Hon. A. E. Borie, Secretary of the Navy of a succeeding administration, issued General Order No. 101, by which he "removed the sentence of Capt. Collins, and restored his forfeited pay to him in consequence of good conduct during the war of the Rebellion," and the same day, by General Order No. 102, the *executed* sentence of Lieut.-Commander Bache was "revoked on the ground that there is nothing in the record of the proceedings of the court-martial to justify the sentence. So much of Lieut.-Commander Bache's pay as was stopped by the sentence will be restored to him."

It is held to be as impossible in law to set aside a valid consummated sentence of dismissal as it is to recall or undo corporal punishment that has been actually undergone. Relief must be had in a new appointment by authority of Congress; hence dismissed officers are continually petitioning the National Legislature for restoration. President Lincoln decided, June 4, 1862, that he could "remove the disability" of dismissed *volunteer* officers commissioned by governors of States. Though the President has power to remit forfeitures and fines *before* they are paid, he cannot authorize their return after being legally forfeited without violating the provisions of Art I., Section 9, of the Constitution, which prohibits the taking of money from the treasury except in pursuance of specific resolves of Congress.

The analogy between a sentence prohibiting the drawing of pay that would otherwise become due, and the case of a forfeiture actually paid into the treasury by the party himself is deemed to be complete. *Ibid.* In the case of a soldier dishonorably discharged by a part of the sentence of a court, it was held that a pardon granted subsequently, while undergoing imprisonment, could not operate to entitle him to an honorable discharge. The statute of limitation as to amenability to trial for crimes committed is three years in the navy (see Navy Department, General Order 196), and the expiration of this time, where the offense is known, without charges being preferred meanwhile, operates as a full pardon. When the clemency of the President is desired, it is usually invoked by reference through the Navy Department, by direct petition in writing, or through a friend or attorney. (See COURTS-MARTIAL.)—*Henry C. Cochrane, Captain U.S.M.C.*

Pargos. A fish resembling a large bream, from which the crews of Quiros and Cook suffered violent pains and bad effects. The porgy of Africa and the West Indies.

Parhelia, or Mock Suns. Images of the true sun which appear at the same height above the horizon as the true sun, and are connected with one another by a white horizontal circle or halo, of which the pole is at the zenith, and the apparent semi-diameter equal to the sun's distance from the zenith. Those which appear on the same side of this circle with the true sun are tinted with the prismatic colors, and sometimes a part of the circle itself contiguous to them appears colored; but those which appear on the circumference opposite to the sun are always without color; whence it may be conjectured that the latter, as well as the luminous ring itself, are produced by reflection, and the others by refraction.

Pariah. The low-caste people of Hindostan; outcasts. *Pariah-dogs*, outcasts of no known breed.

Paris, The Declaration of, was adopted in April, 1856, by the plenipotentiaries of Great Britain, Austria, France, Russia, Prussia, Sardinia, and Turkey, assembled in Paris, and covers the following points:

1. Privateering is and remains abolished.
2. The neutral flag covers enemy's goods, with the exception of contraband of war.
3. Neutral goods, with the exception of contraband of war, are not liable to capture under enemy's flag.
4. Blockades, in order to be binding, must be effective; that is to say, maintained by a force sufficient really to prevent access to the coast of the enemy.

And it was agreed that the powers which should adopt this declaration could not thereafter enter into any arrangement in regard to the application of the right of neutrals in time of war, which did not comprise all the four principles of the declaration.

The French government communicated this declaration to the government of the United States, in order to obtain its assent thereto. But the United States refused to adopt the declaration, unless the first principle should be amended by adding thereto these words: "And that the private property of the subjects or citizens of a belligerent on the high seas shall be exempted from seizure by public armed vessels of the other belligerent, except it be contraband."

The U. S. government considered that if the

first principles of the declaration were adopted without the proposed amendment, the states which kept small naval forces would be at the mercy of those which would adopt the policy and have the means of keeping up large navies. (See dispatch of Mr. Marcy to the Count de Sartiges of July 28, 1856.) Not only the United States, but Spain and Mexico also refused their consent, and so far as these powers are concerned, privateering—that is, the employment of private cruisers commissioned by the state—is still a perfectly legitimate mode of warfare.

The French Minister of Foreign Affairs made a report to the Emperor of the French, that, besides the states represented at the Congress of Paris, the following governments had declared their intentions to adhere to the four principles of the declaration: Baden, Bavaria, Belgium, Brazil, Duchy of Brunswick, Chili, the Argentine Confederation, the Germanic Confederation, Denmark, the Two Sicilies, Ecuador, the Roman States, Greece, Gautemala, Hayti, Hamburg, Hanover, the Two Hesses, Lubeck, Mecklenburg-Strelitz, Mecklenburg-Schwerin, Nassau, Oldenburg, Parma, Holland, Peru, Portugal, Saxony, Saxe-Altenburg, Saxe-Coburg-Gotha, Saxe-Meiningen, Saxe-Weimar, Sweden, Switzerland, Tuscany, and Wurtemberg.

Parker, Foxhall A., Commodore U.S.N. Born in New York. Appointed from Virginia, March 11, 1839; attached to sloop "Levant," West India Squadron, 1840; served in Florida against the Indians.

Promoted to passed midshipman, June 29, 1843; steamer "Michigan," on the lakes, 1844–45; coast survey, 1848; Mediterranean Squadron, 1849–50.

Commissioned as lieutenant, September 28, 1850; steam-frigate "Susquehanna," East India Squadron, 1851–53; coast survey, 1854–55; unemployed, 1856–59; Pacific Squadron, 1859–61; navy-yard, Washington, as executive-officer, 1861–62; doing duty with the navy on the Potomac, and with the army at Alexandria; while attached to the navy-yard at Washington, was ordered, two days after the battle of Bull Run, to Fort Ellsworth, with 250 seamen and marines, to protect it from the attack of Gen. Beauregard, who was expected to storm it, and by his prompt and vigorous action contributed greatly to the safety of Alexandria, and to rallying the men from their demoralization after the defeat at Bull Run.

Commissioned as commander, July 16, 1862; commanding steam-gunboat "Mahaska," 1863; in command of the naval battery on Morris Island, at the bombardment of Fort Sumter, from the 17th to the 23d of August, 1863; engaged with skirmishes with batteries on Potomac and Rappahannock Rivers, and off Wilmington, N. C., with rebel troops on shore, while commanding the "Mahaska," in 1863, and the Potomac Flotilla, in 1864–65; on one occasion, at the head of a small detachment of soldiers and marines, with 2 howitzers manned by seamen, Commander Parker marched some distance into Virginia and drove a force of over 100 cavalry out of Matthew's Court-House, which he took possession of; Bureau of Navigation, 1866.

Commissioned as captain, July 25, 1866; special duty, Hartford, Conn., 1867–68; navy-yard, Boston, 1869–70; commanding frigate "Franklin," European Squadron, 1870–71; member Board of Examiners, 1872.

Commissioned as commodore, November 25, 1872; was chief-of-staff to the North Atlantic Fleet, 1872; ordered to special duty at Washington, August 7, 1872, to draw up a code of signals for steam tactics, and chief signal-officer of the navy, 1873–76. In 1863 he prepared, by order of the Navy Department, systems of "Fleet Tactics under Steam," and "Squadron Tactics under Steam"; in 1865, "The Naval Howitzer Afloat"; and in 1866, "The Naval Howitzer Ashore"; all of which works are text-books at the Naval Academy. Was one of the founders of the U. S. Naval Institute, organized October 9, 1873, at Annapolis, "for the advancement of professional and scientific knowledge in the navy." In December, 1874, Commodore Parker was appointed chief-of-staff of the united fleets under command of Admiral Case, which were assembled for instruction in tactics in the Florida waters; commanding navy-yard, Boston, Mass., 1877–78; superintendent Naval Academy, 1878–79. Died June 10, 1879, while in command of the Academy.

Par-line. A term signifying the normal level of a barometer at a given station.

Parole. A promise on honor given by a prisoner of war, when allowed to go at large, that he will fulfill the conditions specified in his release. In paroling, documents are made out in duplicate, and the names and rank of the persons paroled are entered therein. A person who intentionally misstates his rank forfeits his parole and is liable to punishment. The agreement extends to the existing, and not to any future, war. No one but a commissioned officer can give a parole for himself and his command, and no inferior officer can give it without the authority of the senior officer present. Any officer or man disobeying this law renders himself liable to be punished as a deserter. The only exception is when a man has suffered long confinement without the possibility of being paroled through an officer. No person can be forced to give his parole, and ill-treatment or threats, in consequence of refusal to pledge a parole, are contrary to the laws of war. While the pledging of a parole is a voluntary act on the part of the individual, the capturing power is not obliged to grant it.

Parol Evidence. Evidence given by word of mouth, in contradistinction to that furnished by writings.

Parr. A small species of fish common where salmon breed, respecting which there has been much dispute whether it is the young of the salmon, or a trout having the general appearance of these.

Parrel. A rope or iron collar encircling the mast and attached to the slings of the yard, to confine the yard to the mast, but permitting a vertical movement.

PARREL-LASHING. The lashing between the two eyes of a rope parrel.

Parrot-fish. A fish of the genus *Scarus* inhabiting the tropical seas, so named from its resemblance to the parrot in the brilliancy of its colors and the peculiar form of its jaws.

Parrott-gun. A rifled gun invented by R. G. Parrott. See ORDNANCE.

Parry, Sir William Edward, generally known

as Sir Edward Parry, a skillful and celebrated English navigator, was born at Bath, December 19, 1790. Originally destined by his father for the medical profession, he, instead, acted on the advice of a friend, and entered as a first-class volunteer on board the "Ville de Paris," the flag-ship of the Channel fleet, in 1803. On January 6, 1810, he was commissioned as a lieutenant, and in February of the same year was sent in command of a ship to the Arctic regions to protect the British whale-fisheries. In 1813 he was recalled and ordered to the fleet then blockading the United States, where he remained until 1817. In April, 1818, he was appointed to the command of the "Alexander," and accompanied Sir John Ross in search of the northwest passage; again, in May, 1819, he was sent on the same kind of an expedition, and this time immortalized himself as the greatest of all Arctic explorers. Upon his return he was greeted with the utmost enthusiasm, and was promoted to commander, November 4, 1820, and made a member of the Royal Society. He subsequently made a second and a third voyage to the same regions, but effected nothing further of importance. He remained in England until 1827, when he made another voyage to the Arctic regions in the "Hecla," his old ship. From 1829 to 1834 he was commissioner to the Agricultural Company of Australia. In 1834 he returned to England, where he filled in succession various government offices until 1846, when he retired. June 4, 1852, he was promoted to the rank of rear-admiral of the white, and the following year was appointed lieutenant-governor of Greenwich Hospital, an office which he held till his death, July 7, 1855, at Ems, in Germany.

Parsee (Pers. *parsi*). The name given by English writers to the Persian refugees, driven from their country by the persecutions of the Mussulmans, who now inhabit various parts of India. Their principal emigration to Baroach, Surat, and the neighboring coast is supposed to have taken place about the end of the 8th century. The sacred fire, the emblem of their religion,—called *behrem*,—is believed by them to have been brought by the first emigrants from Persia, and, after many changes of place, is now preserved at Odisari and Nausari, near Surat, and at Bombay. In this latter city, under the protection of the British government, they have increased in numbers until now they form about one-fifth of the entire population. They are generally wealthy, and distinguished for activity and enterprise in the various departments of commerce and trade. Their character is variously estimated by different observers; but all agree in attributing to them industry and economy, and attachment to their religion, and to those of the higher class strong sentiments of honor and honesty.

Part. To break; as, a rope or chain. *To part company.* See COMPANY.

Partners. Any plank which is thicker than the rest of the deck-planking, for the purpose of steadying or making stronger whatever passes through the deck, as at the pumps, masts, bowsprit, etc.

Partridges. Large bombards formerly used for siege purposes. Grenades thrown from a mortar.

Party. A gang of men sent on a particular duty.

Pass. *To pass a seizing, gasket, earing*, etc., to secure them in the proper manner. *To pass the hail* is for the sentries or look-outs to utter in succession the prescribed formula to show that they are awake and attentive to their duties. *To pass the word* for a man is to summon him by name, the cry being repeated by the boatswain's mates on all decks. *To pass* an examination, inspection, etc., to undergo them with a favorable result.

Passage. A journey by water from one port to another.

PASSAGE MONEY. The charge made for the conveyance of passengers in a packet or merchant vessel.

Passandeau. An ancient 8-pounder gun of 15 feet length.

Passaree. *To passaree the foresail*, to haul out the clew, when before the wind with lower studding-sail set, by a jigger on the lower studding-sail boom.

Pass-boat. A punt.

Passport. A safe-conduct granted by the state to a citizen, which gives him protection whilst traveling. An accurate description is contained in it for the purpose of identification. See SAFE-CONDUCT.

Passed Midshipman. See MIDSHIPMAN.

Passe-volant. A name applied by the French to a wooden gun on board ship; but it was adopted by early voyagers as expressing a movable piece of ordnance.

Patache. A Portuguese tender for carrying treasure, from 200 to 300 tons, well armed and swift.

Patallah. A large and clumsy Indian boat for baggage, cattle, etc.

Patamar. An excellent old class of advice-boats in India, especially on the Bombay coast, both swift and roomy. They are grab-built; that is, with a prow-stern, about 76 feet long, 21 feet broad, 11 feet deep, and 200 tons burden. They are navigated with much skill by men of the Mopila caste and other Mussulmans.

Patamometer. An instrument for measuring the force of currents.

Pataxos. A small vessel formerly used by the Spaniards as an advice-boat.

Patch. A piece of lead over the water-cap of a time-fuze, to protect the quick-match and composition from moisture; it is removed when the shell is entered in the bore.

Patella. A genus of gasteropodous univalve mollusks the shell of which has nearly the shape of a shallow, conical dish; the limpet.

Patent Block. A block fitted with friction-rollers.

Paterero. A small piece of ordnance, now obsolete, working on a swivel and fitted on the rail, for clearing the enemy's deck and for firing into boats. A kind of small mortar sometimes fired for salutes or rejoicing, especially in Roman Catholic countries on holidays.

Paternoster-work. The framing of a chain-pump.

Path. The trajectory of a projectile. The orbit of a heavenly body.

Patoo-patoo. A formidable weapon with sharp edges, used by the Polynesian Islanders and New Zealanders as a sort of battle-ax to cleave the skulls of their enemies.

Patron. See PADRONE.

Patterson, Daniel T., Captain U.S.N. Born in New York, 1771; died at Washington, D. C., August 25, 1839. Midshipman, August 20, 1800; attached to the frigate "Philadelphia," Capt. Bainbridge, when she ran upon a reef off Tripoli, and was taken by a flotilla of gunboats, and remained a prisoner in Tripoli until 1805; lieutenant, January 24, 1807; master-commandant, July 24, 1813; captain, February 28, 1815; navy commissioner, 1828–32; and commanded a squadron in the Mediterranean in 1832–35. In 1832, he commanded the U. S. naval forces at New Orleans, and co-operated so ably with Gen. Jackson in the defense of that city that he received the thanks of Congress.

Patterson, Thomas H., Rear-Admiral U.S.N. Born in Louisiana, May, 1820. Appointed from Louisiana, April 5, 1836, as acting midshipman; attached to brig "Porpoise," survey of Southern harbors, July 20, 1836, to February 14, 1837.

Promoted to midshipman, March 3, 1847; navy-yard, Washington, March 9 to April 20, 1837; ordered to frigate "Macedonian," Exploring Expedition, April 20, 1837; sloop "Falmouth," Pacific Squadron, 1837–40; navy-yard, Washington, to 1841; Naval School, Philadelphia, 1842.

Promoted to passed midshipman, July 1, 1842; Naval Observatory, 1842–43; attached to brig "Lawrence," as acting master, West India Squadron, from August 31 to November 1, 1843, and as acting lieutenant, to April 17, 1844; attached to brig "Washington," coast survey, from April 17, 1844, to October 31, 1848.

Promoted to master, October 31, 1848.

Commissioned as lieutenant, June 23, 1849; attached to sloop "Vandalia," Pacific Squadron, from July 11, 1849, to October 12, 1852; special duty, Washington, D. C., to December 23, 1852–54; sloop "Jamestown," flag-ship, coast of Africa, to June 8, 1857; navy-yard, Washington, D. C., to October 13, 1857–59; steam-sloop "Mohican," coast of Africa, to October 15, 1861; commanding steam-gunboat "Chocura," Hampton Roads, York River; present at the siege of Yorktown, May 4, 1862; took part in expedition and was the leading gunboat up the Pamunkey River to the White House,—to open the way, and in support of Gen. McClellan's army; co-operated with the advance of Gen. Stoneman's command at the White House, in checking the approach of the enemy at that point; from early in June until October, 1862, senior officer of the naval forces in the York and Pamunkey Rivers, and in constant co-operation with the Army of the Potomac.

Commissioned as commander, July 16, 1862; commanded the steamer "James Adger," South Atlantic Blockading Squadron, from November 18, 1862, to June 27, 1865; towed the ironclad "Montauk" to Beaufort, N. C.; thence to Port Royal, January 2, 1863; blockade duty off Wilmington, N. C., July 7, 1863; cut out the steamer "Kate" from under the batteries at New Inlet, N. C., July 31, 1863; participated in the attack and capture of a flying battery, a few miles above Fort Fisher, N. C., August 23, 1863; chased ashore and captured the blockade-runner "Cornubia," between New Inlet and Masonboro' Inlet, N. C., November 8, 1863; chased and captured the blockade-runner "Robert E. Lee," off Cape Lookout, November 9, 1863,—both vessels loaded with arms and supplies for the Confederate army; captured schooner "Ella," off Masonboro' Inlet, N. C., November 26, 1863; blockade duty, South Atlantic Blockading Squadron, June 14, 1864; senior officer of the outside blockade, off Charleston, S. C., September 15, 1864; convoy duty, Maraquana passage, April 25, 1865; detached, waiting orders, June 27, 1865; commanding the steam-sloop "Brooklyn," flag-ship Brazil Squadron, September 19, 1865, to September 16, 1867.

Commissioned as captain, July 25, 1866; navy-yard, Washington, D. C., from December 26, 1867, to June, 1871.

Commissioned as commodore, November 2, 1871; special duty, Washington, 1871–72; commandant navy-yard, Washington, 1873–76; president Board of Examiners, 1876–77.

Commissioned as rear-admiral, 1877; commanding Asiatic Station, 1878, to October, 1880.

Pattison, Thomas, Commodore U.S.N. Born in New York, February 8, 1822. Appointed from New York, March 2, 1839; attached to steam-sloop "St. Louis," Pacific Squadron, 1839–42; receiving-ship, Boston, 1843; Naval School, Philadelphia, 1845.

Promoted to passed midshipman, July 2, 1845; steamer "Princeton," 1846; during the Mexican war, served in the following ships as passed midshipman and sailing-master: "Raritan," "Cumberland," "Electra," "Scorpion," and gunboat "Reefer"; coast survey, 1850–51; sloop "Portsmouth," Pacific Squadron, 1852–55.

Promoted to master, 1854.

Commissioned as lieutenant, September 12, 1854; receiving-ship, Boston, 1855–56; navy-yard, Boston, 1857; steam-frigate "Mississippi," East India Squadron, 1857–60; Naval Station, Sackett's Harbor, 1860–61; sloop "Perry," Atlantic Squadron, 1861; executive-officer of the "Perry" at the time of the capture of privateer "Savannah," off Charleston, June 4, 1861; commanding steamer "Philadelphia," Potomac Flotilla, 1861; engagement with Acquia Creek batteries, October 1, 1861, and engagement with Potomac River batteries, the latter part of October, 1861.

Commissioned as lieutenant-commander, July 16, 1861; commanding steamer "Sumter," South Atlantic Blockading Squadron, 1862; commanding the "Clara Dolson," Mississippi Squadron, 1863; commandant Naval Station, Memphis, Tenn., 1863–65.

Commissioned as commander, March 3, 1865; commanding steamer "Muscoota," Atlantic Squadron, 1866–67; navy-yard, Norfolk, 1867–69.

Commissioned as captain, June, 1870; commanding "Richmond" (second-rate), 1872; commanding "Saranac" (second-rate), North Pacific Station, 1872–73; commanding receiving-ship "Independence," Mare Island, 1874–77.

Commissioned as commodore, December 11, 1877; commanding Naval Station, Port Royal, S. C., 1878–80; commandant navy-yard, Washington, since July 10, 1880.

Paugie. A name for the porgy.

Pauhaugen. An Indian name for the menhaden. Written also *pohagen*.

Paunch-mat. A thick, strong mat made by interweaving strands of rope; it is used to protect the yards or the rigging from chafe.

Pavo (*Lat.* "The Peacock"). An unimportant constellation to the south of Sagittarius, lying between the two bright stars Antares and Fomalhaut. The northernmost star is *a Pavonis.*

Pawk. A young lobster.

Pawl. A short bar which prevents the backward motion of a capstan or windlass.

PAWL-RIM. A cast-iron rim having notches in which fall the lower ends of the pawls when the capstan is hove around.

Pay. A familiar appellation for the paymaster. To cover with melted pitch, tar, rosin, tallow, etc.; as, to pay a seam, to pay a vessel's bottom, etc. *To pay out*, to pass out a rope or chain. *To pay off*, to fall off from the wind in consequence of the force exerted by the rudder, or the arrangement of the sails, or both. *To pay round*, to turn the ship's head.

Pay Corps of the U. S. Navy. *Origin.*—The pay corps of the navy is the outgrowth of the old system of "pursers," by which name old officers still frequently call the paymaster.

The pursers were civilian appointments made for the cruise of a vessel only, and the recipients of such appointments were usually practical business men, whose duties were to provide provisions, clothing, sutler's goods, etc., for men, to purchase all articles needed in the various departments of a ship, and to pay all officers and men attached thereto, as well as to provide the funds therefor, their duties being of such a nature that they were frequently styled the ship's "husband." They were furnished bills of exchange and letters of credit, and their compensation was a commission on expenditures; so large were these commissions that some cruises proved very profitable to the purser.

Reorganization.—To save such heavy commissions and systematize accounts, as well as to render the service more homogeneous, Congress established the corps of paymasters. The pursers were incorporated into the navy under the new cognomen. Their duties remained the same in all essentials, but their relation to the navy proper, compensation, and accounting were materially changed. Instead of civilians they became officers; in lieu of commissions they receive fixed salaries; and a Bureau of Provisions and Clothing was formed in the Navy Department for receiving regular returns for those articles, as well as sutler's goods, now called "small stores." Abstracts of purchases for other Departments are required to be made to the respective chiefs of bureau of those Departments, while accounts for pay and money proper are rendered to the Fourth Auditor of the Treasury. The office is for life, and the results of this reorganization are such that the losses to the government from all sources, through the administration of the pay corps, are but a small fraction of one per cent. of amount disbursed.

Organization of pay corps at present.—On the first reorganization there were only paymasters, then assistants were added, then passed assistants; the rank (a relative one) was at first arbitrarily fixed by the Secretary of the Navy, but is now fixed by law to correspond as nearly as possible to that of the line-officers entering service at same time with the assistant paymaster. Thus reorganized, the pay corps of the navy consists of 13 pay-directors, ranking with captains; 13 pay-inspectors, ranking with commanders; 50 paymasters, ranking with lieutenant-commanders or lieutenants; 30 passed assistant paymasters, ranking with lieutenants or masters; and 20 assistant paymasters, ranking with masters or ensigns,—the alternative rank being decided by length of service.

Conditions of appointment and promotion.—Assistant paymasters must be 21 and not over 26 years of age on entering the service; they must pass a physical and a mental examination before a medical board for the first, and a board of pay-officers for the last, to prove their fitness; they are promoted as vacancies occur, and must pass a similar examination to the first on each promotion, with the addition that they must be able to speak the French and Spanish languages with sufficient fluency to do business in them, and also furnish to the Pay Board a certificate of the Fourth Auditor of the Treasury that their accounts have been kept to the satisfaction of that Department.

Bonds.—All pay-officers on entering the service, on each promotion, and as often as called on by the Secretary of the Navy, must furnish a bond with two sureties or more, worth in all double the amount of the bond; the sufficiency of the sureties must be certified to by the judge or attorney of a U. S. district court, and be approved by the Secretary of the Navy. The bond of a paymaster is $25,000, of a passed assistant, $15,000, and an assistant, $10,000.

Paymaster-general.—The chief of Bureau of Provisions and Clothing, the representative head of the corps, is styled paymaster-general, has relative rank with commodores, is appointed by the President from among the senior paymasters, and on confirmation by the Senate is commissioned for four years. The paymaster-general has supervision over all returns made to his bureau, the records pertaining thereto, the issuing of instructions to the corps, assignments to duty,—in fine, a general supervision over the corps.

Division of duty.—The service of paymasters of all grades is divided into two kinds, termed "shore-" and "sea-service," consisting ordinarily of terms of three years each, with "waiting orders" or leave intervening. "Shore-service" consists, first, of duty at purchasing agencies in the large cities for payment of transportation, purchases, and allotments; secondly, of duty in charge of provisions, clothing, and small stores at navy-yards, receiving such stores from the purchasing agencies and ships returning from cruises, and supplying ships fitting for a cruise; thirdly, of duty as paymasters of navy-yards, paying all workmen, all officers attached to the yard, and a certain proportion of officers "on leave" or "waiting orders"; and, fourthly, of duty as paymasters of receiving-ships where recruits are received; the paymaster being furnished by the recruiting officers with a descriptive list of the recruit, and a transcript giving his rating, pay, term of enlistment, etc., a copy of which must accompany him on all his transfers. To the purchasing agencies pay-directors are usually assigned; to the charge of stores, pay-inspectors; and to the payment of yards and receiving-ships, paymasters; as assistants to these, passed assistant and assistant paymasters are sometimes assigned.

The "sea-service" consists of being attached

to a vessel in commission, which vessel is usually on a cruise and attached to a fleet or squadron.

Fleet-paymaster.—The senior paymaster, attached generally to the flag-ship, is fleet-paymaster, and as such makes all purchases and distributes funds to the paymasters of other vessels in company with the flag-ship; but when separated each paymaster acts independently.

General Duties.—The duty of a paymaster at "sea" embraces all those of a paymaster, viz.: the purchasing of all supplies, the charge of all stores in his department, the payment of officers and men, and the providing of means therefor by negotiating drafts, for which purpose he is provided with blank bills of exchange and a letter of credit.

Purchases.—All purchases are made upon requisition by the officer in charge of the department needing the articles, and before made must be submitted to and approved by the commanding officer.

Responsibility for purchases.—The division of responsibility is in all cases as follows: the commanding officer is responsible for the necessity of the purchase; the officer requiring the articles for the quantity and quality, and their care, after receiving them; and the paymaster for their cost and arithmetical calculations on the bill.

Surveys.—In case of loss of any unusual quantity of stores in charge of paymasters, such as provisions, clothing, and small stores, to free himself from loss, the paymaster must request the commanding officer to appoint a "special" board of survey to ascertain and report the facts in the case. For ordinary loss and waste, the commander appoints a quarterly board to serve during a quarter, and report the amount and value of all ordinary waste from deterioration, etc.

Allotments.—In addition to all the regular duties, paymasters on sea-going vessels grant allotments not exceeding half-pay—unless specially authorized by the Secretary of the Navy—to all who desire it, both officers and men, to be paid to whomsoever they select at home. The allotment is paid by the nearest purchasing agent to where the person receiving the allotment resides, and the paymaster of the ship is responsible that it be checked on the rolls, and notification made of discontinuance. Blanks are furnished on requisition at the commencement of a term of duty at a purchasing agency, navy-yard, or the commencement of a cruise, for pay-rolls, bills for purchases, forms of returns, surveys, allotments, etc.; also stationery. Returns must be made as follows, viz.:

Returns and accounts.—Paymasters of "sea-going" vessels must settle their accounts each quarter as if it were final, in the mean time rendering a monthly summary statement of their accounts.

Their returns to the Treasury Department are made direct, although they must bear the approval of their immediate commanding officer, and the final or quarterly returns transmitted to the treasury must consist of—

1st. A general pay-roll embracing individual accounts of officers, men, and marines, with credits for pay and debits for money paid, money value of clothing and small stores furnished, and checkages of all kinds; also showing the dates of entry and detachment of officers, the entry, discharge, transfer, desertion, death, and expiration of the terms of enlistment of men, and the vessel or station to which officers, men, and marines have been transferred. It must be signed in a receipt column by each officer, man, and marine, and the signatures of men and marines must be witnessed in each case by an officer, and the roll itself be approved by the commanding officer.

2d. An account current showing all his receipts and expenditures, and the date of his bond, vouchers for all purchases, and contingent bills, a complete money statement of the value of all receipts and expenditures of clothing and small stores; also a full statement of all money received for provisions sold.

3d. An account of the sales of bills of exchange, with the certificate of at least two prominent merchants to the current rate of exchange at the date of negotiating every bill.

4th. All transfer accounts and rolls of officers or men, whether to or from the vessel (each officer and man on his transfer must be furnished with a duplicate statement of his account, one of which the paymaster receiving him on his roll keeps, and receipts and returns the other to the paymaster who makes the transfer).

5th. All official papers necessary to substantiate his accounts; and,

6th. The order of the commanding officer for all ratings and disratings, etc., involving increase or decrease of pay, and for all additions to pay, such as one-fourth for detainment beyond date of enlistment, for enlistments under continuous-service certificates, for honorable discharge money, for 33 cents per diem addition to men employed as firemen or coal-heavers, for money paid for transportation of officers or crew, and for entering newly-enlisted men on the rolls; and the funds appropriated being made by Congress under various appropriations, the expenditures must show under what appropriation they are made.

The returns to the paymaster-general are made through the commanding officer, and follow the official channels. They consist of—

1st. A quarterly return of provisions and contingent.

2d. A quarterly return of clothing.

3d. A quarterly return of "small stores."

4th. A duplicate copy of the account current, but without vouchers, and all receipts, invoices, surveys, etc., substantiating the above returns.

The dividing line between the Treasury and the Bureau of Provisions and Clothing is thus distinctly drawn, the one dealing purely with money values, and the other with property. A paymaster is allowed 30 days after the expiration of a quarter in which to make up and forward his returns, and at expiration of tour of duty is allowed 30, 40, 50, or 60 days, according to the duty he has been on.

In addition to these returns, an abstract of public bills must be rendered at the same time with the quarterly returns to each bureau of the Navy Department on account of which any expenditure has been made. The paymasters on shore-duty make such portions of the above returns as apply to the particular duties to which they are assigned.

Times of payment and issue of stores.—Officers are paid monthly; men receive such portions as the commanding officer directs, and are paid the balance on discharge, and workmen at navy-yards, semi-monthly.

Men receive clothing on monthly division requisitions approved by the commanding officer, and the cost is charged against them on their accounts.

Men receive small stores, including tobacco, soap, etc., on monthly mess requisitions, also approved, and value charged against them.

Officers can buy such articles as they desire at same rates.

Rations and commutation.—Provisions are served out daily, each man being entitled to one ration. Officers are not entitled to rations unless attached to a sea-going vessel. See RATION. There is a ration-table, but the ration consists in substance of one pound of meat, one of bread, one of vegetables, about a quart of coffee, and minor articles, such as butter, molasses, sugar, vinegar, pickles, etc., in proportion. Meat may be salt or canned or fresh, vegetables dry or fresh, and bread hard or soft, or simply flour, as circumstances dictate, etc., under approval of commanding officer. Canned tomatoes and dried fruits are also included.

Officers may commute their ration for 30 cents a day; men are allowed to commute two rations out of a mess of fifteen at same rate to purchase little additional articles for their benefit; and should a man be sick, he may be subsisted by the medical department, and on notification of that fact the paymaster commutes the invalid's ration at same rate for benefit of the medical department.

Hospital fund.—From the pay of each officer and man in the service a monthly sum of 20 cents is deducted for the hospital fund.

Accountability and percentage of loss.—The pay-officer is held to strict accountability for the proper care of all stores and money under his charge, but he is allowed 7 per cent. on provisions, 2 on small stores, and 1½ on clothing for necessary waste in issuing. He is also to make such other additional returns to those above mentioned as he may be called on to make for the information of his superior officers in command.

Clerical assistance.—To enable him to perform all these duties a clerk is allowed to the paymaster of all ships having a complement of 175 persons or more, to those at shore-stations, in receiving-ships, etc.; on board ship a yeoman to issue clothing, small stores, provisions, etc., is allowed, and at shore-stations additional writers, etc., according to the requirements of the different offices. Thus while there are some changes that might be desirable, the organization and accountability of the pay corps are very nearly all that could be wished. There are many other incidental duties in addition to those mentioned, which, however, are so interwoven with other departments as to come more properly under other titles.—*C. D. Mansfield, Paymaster U.S.N.*

Pea-ballast. A coarse, fresh-water sand used by ships in the China trade for stowing tea-chests upon.

Peacock-fish. A beautiful fish of the Mediterranean (*Labrus pavo* of Linnæus).

Pea-crab (*Pinnotheres*). A genus of brachyurous crustaceans with nearly circular and not very hard carapace. They are of small size, and interesting from their living within the mantle-lobes of lamelli branchiate mollusks. Species are found in almost all parts of the world.

Pea-jacket. A heavy coat worn by sea-faring men in cold weather; it is generally made of pilot-cloth.

Peak. The pee of an anchor. The outer end of a gaff. The upper after corner of a four-sided fore-and-aft sail. The contracted part of the hold, forward or aft. To raise a gaff or lateen-yard to a sharper angle with the mast. To cant the oars forward or up. See A-PEAK.

PEAK-BRAILS. The brails nearest the peak of a gaff-sail.

PEAK-HALLIARDS. The outer halliards for hoisting or lowering a gaff.

Pearl. A beautiful concretion found in the interior of the shells of many species of mollusks, resulting from the deposit of nacreous substance round some nucleus, mostly of foreign origin. The *Meleagrina margaritifera*, or pearl-oyster of the Indian seas, yields the most numerous and finest specimens.

Pecten. A kind of shell-fish.

Pectinal. A fish whose bones resemble the teeth of a comb.

Pectinibranchiata. An order of gasteropodous mollusks, having the gills composed of numerous leaflets or fringes, arranged like the teeth of a comb, and affixed to the internal surface of a cavity which opens with a wide opening above the head. The sexes are distinct. All have two tentacles and two eyes—the eyes often stalked. The mouth is produced into a proboscis, more or less lengthened. The eggs are deposited in a mass, with an envelope often of very remarkable and complicated form, which is produced by coagulation of a viscous albuminous matter secreted by a peculiar gland of the female. The order is very numerous, the greater number of gasteropods being included in it. Some have a siphon, and some are destitute of it; some have spiral, and some simply conical shells. Almost all are inhabitants of the sea or its shores, a few are found in fresh water. To this order belong Whelks, Periwinkles, Cones, Volutes, etc.

Pectoral Fins. The pair situated behind the gills of fishes, corresponding homologically to the fore limbs of quadrupeds and the wings of birds.

Pedro. An early gun of large calibre for throwing stone balls.

Pedro-pee. *To dance pedro-pee*, to walk a seam,—an old plan of testing a sailor's sobriety.

Pee. The bill of an anchor.

Peek. See PEAK.

Pegasus (named after a mythical winged horse of the Greeks). A constellation, the four principal stars of which, α, β, γ, δ, form a remarkable square; δ *Pegasi* is also called α *Andromedæ*, and the two other stars of Andromeda, β and γ, together with the adjoining β *Persei*, form, with the square of Pegasus, a group very similar to, though much more extensive than, the Great Bear lying on the opposite side of the pole. Cassiopeia lies about midway between Polaris and Pegasus. α *Pegasi* is the farthest from Andromeda and the westernmost of the constellation, and β is at the northern angle. There are two small stars, η and ξ, which are parallel to this side of the square and serve to identify it. α *Pegasi*,

Markab. *β Pegasi*, Skeat. *γ Pegasi*, Algenib. *δ Pegasi*, or *a Andromeda*, Alpheratz.

Pegasus. A genus of fishes with large pectoral fins, by means of which they take short flights or leaps through the air.

Pelagians. Fishes of the open sea.

Pelecanidæ. A family of palmiped birds (the *Totipalmati* of Cuvier) characterized by a long, straight, compressed bill, broad at the base, often with a pouch beneath the lower mandible; long wings, of which the first quill is the longest; short strong legs, and all the toes, including the hind one, united by a membrane. They are generally excellent swimmers, expert divers, and birds of powerful flight. Some of them often perch on trees, which few other web-footed birds do. To this family belong pelicans, cormorants, frigate-birds, tropic-birds, and darters.

Pelican. A well-known water-bird. Also, the old 6-pounder culverin.

Pemblico. A small bird whose cry was deemed ominous at sea as presaging wind.

Pemmican. Condensed venison, or beef, used by the hunters around Hudson's Bay, and largely provided for Arctic voyages, as containing much nutriment in a small compass. Thin slices of lean meat are dried over the smoke of wood fires; they are then pounded and mixed with an equal weight of their own fat. It is generally boiled and eaten hot where fire is available.

Penang-lawyer. A cane with a very large round head, common in Penang and on the Malay Peninsula.

Pencel. A small streamer or pennon.

Penchute. A chute which conducts the water from a race to a water-wheel.

Pendant. A short piece of rope having generally a thimble or block in one end; as, brace-pendants, mast-head pendants, reef-pendants, etc. See PENNANT.

PENDANT, IRISH. The loose end of a rope, gasket, etc., hanging about the rigging or sails.

PENDANT-TACKLE. A heavy tackle, the upper block of which is hooked into the lower mast-head pendant.

Pendulum. See GUN-PENDULUM.

Penguin (*Aptenodytes*), a genus of birds of the family *Alcidæ*, and divided into several genera and sub-genera. The body is of an elliptical form, the neck of moderate length, the head small, the bill moderately long, straight, and more or less compressed. The tail is very short. Some of them have a long, slender, and pointed bill, the upper mandible a little curved at the tip, and feathered for about a third of its length. Some, sometimes called Gorfews or Gorfous (*Chrysocoma*), have a stout and pointed bill, a little curved at the tip; others, Sphenisques (*Spheniscus*), have a straight and compressed bill, irregularly furrowed at the base. The wings, too short for flight, are covered with short, stiff, scale-like feathers, and are admirably adapted for swimming. The legs are very short, and are placed far back, so that on land penguins rest on the tarsus, which is widened like the sole of the foot of a quadruped, and stand perfectly erect. Their bones, unlike those of birds in general, are hard, compact, and heavy, and have no air-cavities; those of the extremities contain an oily marrow. Penguins are found only in the southern hemisphere, and chiefly in high southern latitudes.

Peninsula. A body of land nearly surrounded by water, but joined to the mainland by a narrow neck, called an isthmus.

Penknife-ice. A name given by Parry to ice the surface of which is composed of numberless irregular vertical crystals, from 5 to 10 inches long, about half an inch broad, and pointed at both ends. It is supposed to be produced by heavy drops of rain piercing their way through the ice rather than by any peculiar crystallization while freezing.

Pennant. A *narrow-pennant* is worn by all government vessels in commission and commanded by an officer below the grade of commodore. This pennant is not an emblem of rank, but signifies that the vessel flying it is of a public character. It is worn at the main.

A *broad-pennant* is the distinctive mark of a commodore; it is of blue bunting, swallow-tailed, contains one white star, and is worn at the main. When two or more commodores are in company the senior wears the blue, the next in rank the red, and the other or others the white pennant.

A *senior officer's pennant* is worn at the mizzen. Pennants are much used in signaling. See SIGNALS.

PENNANT-SHIP. A vessel commanded by a commodore.

Pennock. A little bridge thrown over a water-course.

Penny-widdie. A haddock dried without being split.

Pensacola is a port of entry and the capital of Escambia County, Fla. It is situated on the west shore of Pensacola Bay, 10 miles from the Gulf of Mexico. The harbor has 20 feet of water on the bar, and is one of the safest in the Gulf of Mexico. At the entrance of the harbor are situated Forts Pickens and McRae, and at Warrington, 7 miles to seaward, the U. S. navy-yard and Fort Barrancas are situated. Steamers ply regularly between Pensacola, New Orleans, and Havana. See NAVY-YARD.

Pensions, Navy. Payments by the United States to persons disabled in the naval service, or marine corps, and to the dependents of persons killed, or who have died in consequence of injuries received in such service.

Any person disabled by wounds received or disease contracted in the naval service, or the marine corps, while in the line of duty, and who has been honorably discharged; and any master serving on a gunboat, or any pilot, engineer, sailor, or other person not regularly mustered, serving on any gunboat or other war-vessel of the United States, disabled by such service from procuring subsistence by manual labor, is entitled to a pension. Any enlisted man who has served 20 years in the navy or marine corps and is disabled by age and infirmity, or any enlisted person who has served 10 years and is disabled, on recommendation of a board of 3 naval officers may receive aid from the navy pension fund. (See NAVY PENSION FUND.) No person is entitled to a navy pension for disabilities received subsequent to July 27, 1868, unless he was at the time in the line of duty and was borne on the books of some vessel of the United States, at sea or in a harbor, actually in commission, or was at some naval station, or on his way by authority to the United States, or to some other vessel, or

naval station, or hospital. Loyalty is essential in all cases.

The following are the monthly rates of pensions for total disability: Lieutenant-colonel and higher officers in the marine corps, captain and officers of higher rank, commander, surgeon, paymaster, and chief engineer ranking with commander, lieutenant commanding and master commanding, \$30. Major, marine corps, and lieutenant, surgeon, paymaster, and chief engineer ranking with lieutenant and passed assistant surgeon, \$25. Captain, marine corps, and professor of mathematics, master, assistant surgeon, assistant paymaster, and chaplain, \$20. First lieutenant, marine corps, and acting assistant surgeon, \$17. Second lieutenant, marine corps, and first assistant engineer, ensign, and pilot, \$15. Cadet midshipman, passed midshipman, midshipman, clerk, master's mate, and warrant-officer, \$10. All other persons, \$8. After March 3, 1877, pensions of passed assistant engineers, assistant engineers, and cadet engineers in the naval service are the same as pensions allowed officers of the line, with whom they have relative rank. The rate of pensions for other than total disability is governed by the extent of the disability.

The laws and regulations relating to the following matters are the same for navy as for army pensions, viz.: the rate of pension for permanent specific disability; the time when the right to a pension accrues; the rights of widows, children, and other dependents of deceased officers and men; artificial limbs, or money in lieu thereof; places and times of payment of pensions; and the manner of applying for and obtaining all benefits under the pension laws.

Whenever any person entitled to a navy pension is admitted to a navy hospital or to the Naval Asylum, his pension during his continuance in the hospital is paid to the Secretary of the Navy and returned to the navy pension fund.

Pension Fund, Navy. A fund derived from the government's share of money obtained from the sale of prizes captured by U. S. vessels. (See Prize-money.) It is provided by law that money so accruing shall be and remain forever a fund for the payment of pensions to officers, seamen, and marines who may be entitled to receive the same; and if such fund be insufficient for the purpose, the public faith is pledged to make up the deficiency; but if it should be more than sufficient, the surplus shall be applied to the making of further provision for the comfort of the disabled officers, seamen, and marines. The Secretary of the Navy is trustee of the fund, which now amounts to \$14,000,000, and is invested in government securities paying 3 per cent. interest.

Any enlisted man who has served 20 years in the navy or marine corps, and is disabled by age or infirmity, may, if he so elects, receive a sum from the pension fund, equal to one-half the pay of his rating at the time of his discharge, to be paid quarterly by a pension agent. This is in lieu of being provided with a home in the Naval Asylum at Philadelphia. Applications for this pension must be made to the Secretary of the Navy, who, if satisfied the applicant is entitled thereto, will direct the Commissioner of Pensions to issue a certificate.

Every disabled person who has served 10 years in the navy or marine corps, and has not been discharged for misconduct, may apply to the Secretary of the Navy for aid from the pension fund. A board of 3 officers will examine the condition of the applicant, and recommend a suitable amount for his relief, to be paid quarterly, for a specified time. If the Secretary approve the recommendation, the Commissioner of Pensions will issue a certificate to the applicant; but the allowance cannot exceed the rate of a pension for full disability corresponding to the grade of the applicant, nor, if in addition to a pension already in the receipt of the applicant, exceed one-fourth the rate of such pension.

Penumbra. A partial shadow. The shadow, in an eclipse, from which the light is not wholly cut off by the intervening body.

Peotta. A craft of the Adriatic, of light burden, propelled by oars and canvas.

Pepper-dulse. *Halymenia edulis;* a pungent sea-weed, which, as well as *H. palmata*, common dulse, is eaten in Scotland.

Perca. A genus of fishes including the perch.

Perch. A pole stuck up on a shoal as a beacon. A spar erected on or projected from a cliff whence to watch fish. An acanthopterygious fish of several species, of the genus *Perca*, inhabiting both fresh and salt water. They have powerful dorsal fins, with strong and sharp spines. The scales are moderately large, with the posterior edge toothed. The name is also applied to several other species of fishes. The common perch of eastern North America is the *Labrax rufus;* the yellow perch, *Perca flavescens.* The black perch of the American seas is the *Centropristis nigricans*, called also *sea-bass.* The blue perch is the *Ctenolambrus cœruleus* of the *Scomber* family.

Percussion-fuze. See Fuze.

Perer. An old gun for throwing stone shot.

Periagua. See Piragua.

Perigee (Gr. *peri*, near; *gē*, the earth). The point in the moon's orbit nearest the earth.

Perihelion (Gr. *peri*, near; *hēlios*, the sun). The point in the orbit of a planet or comet nearest to the sun.

Periko. An undecked boat of burden in Bengal.

Perils of the Sea. A term comprehending the accidents peculiar to ocean navigation which are insured against in policies of marine insurance. In England and in this country a specification of the risks is an essential part of the contract. In most of the countries of Europe, where there is no special agreement of the parties, the perils that the policy is to cover are defined by law

Periodical Winds. See Monsoon.

Periwinkle. A favorite little shell-fish, the pin-patch, or *Turbo littoreus.* The *win-wincle* of the Anglo-Saxon.

Perpendicle. The plumb-line of the old quadrant.

Perry. An old term for a sudden squall.

Perry, Christopher Raymond, Captain U.S.N. Born in Rhode Island, 1760; died at Newport, June 8, 1818. He served with distinction in the Revolutionary navy; was in the hard-fought action of the "Watt" and the "Trumbull," and was for some months confined in the "Jersey" prison-ship; post-captain, January 7, 1798. April 3, 1801, the navy was nearly disbanded, and Capt. Perry was appointed collector of New-

port. His five sons (Oliver H., Raymond H., Matthew C., James A., and Nathaniel H.), all officers of the navy, distinguished themselves during the war of 1812–15. A daughter, Anna Maria, married Capt. George W., son of Commodore John Rodgers, and died at New London, Conn., December 7, 1858, aged 60.

Perry, Matthew Colbreath, Commodore U.S.N. M. C. Perry, son of Capt. C. R. Perry, and brother of Oliver H. Perry, U.S.N., was born at South Kingston, R. I., in 1795. He entered the navy as midshipman in 1809, on the 1st of March. During the war of 1812 he served in the squadrons of Commodores Rodgers and Decatur. Promoted to lieutenant on the 24th of July, 1813. In 1817–19, he was at New York Navy-Yard. In 1820, in the sloop "Cyane," African coast, and the following year also. In 1822–23 he was in command of the schooner "Shark," in the West India Squadron, cruising against pirates. In 1824, he was in the receiving-ship at New York; 1825, went to the Mediterranean as first lieutenant of the "North Carolina," 74, and returned home in 1827; from 1828 to 1830, he was at the naval rendezvous at Charleston; in 1831–33, sloop "Concord"; attached to the navy-yard, New York, in 1835–37. Commissioned as master-commandant, March 21, 1826, and captain in 1837; in 1838–40, in command of the U. S. ship "Fulton," in connection with experiments in steam navigation, and in Europe on light-house duty; in 1841–43, he was at the navy-yard, New York, part of the time in command; in 1844–45 he commanded the African Squadron; in 1846, joined the squadron under Commodore Connor in the steamer "Mississippi"; in 1846, conducted the expedition against Tabasco, in October, capturing several ships and two towns, and afterwards against Laguna; he was left in command March 21, 1847, and so continued until the end of the Mexican war, conducting all the operations against Vera Cruz, in March, Tuspan, in April, and Tabasco, in June; he was on special duty from 1849 to 1852, and in 1853 sailed in command of the East India Squadron, and during the three succeeding years carried the flag into Japanese waters, and successfully made with them the treaty which opened their ports to American enterprise. He was on special duty connected with that expedition during the years 1856–57, and on waiting orders in 1858. He died on the 4th of March, 1858, at New York, aged 63.—*F. S. Bassett*, *Lieutenant U.S.N.*

Perry, Oliver Hazard, Commodore U.S.N. Oliver H. Perry, son of Capt. Christopher R. Perry, was born in Newport, R. I., in August, 1785. He as a midshipman in his father's vessel, the "General Green," received a warrant April, 1799. Sailed in the "John Adams," Capt. Rodgers, in September, 1802, and served in her in the war with Tripoli, being promoted to acting lieutenant at 17 years of age. Returning, he sailed again for the Mediterranean in the "Constellation," Capt. Campbell, in 1805, and was transferred to the "Nautilus" as first lieutenant, and came home in the "Essex." Commissioned a lieutenant January, 1807. Had command of 17 gunboats in New York harbor in 1809. In 1810 commanded the schooner "Revenge," in Commodore Rodgers's squadron. While surveying the coasts of New England he was wrecked on Watch Hill Reef, Conn., January, 1811. In consequence, he was court-martialed, but acquitted of the charges. In command of flotilla at Newport, but was transferred to the lakes, in 1812, and promoted to master-commandant. He led the boats in Commodore Chauncey's attack on Fort George, 27th May, 1813. He had been assigned to the command of the forces on Lake Erie, and returned there after this action. By great exertions he assembled a fleet, and on the 10th of September, defeated the English squadron of 6 vessels, in the celebrated battle of Lake Erie, off Put-in-Bay. His ship, the "Lawrence," was so battered that he abandoned her during the action, going in a boat to the "Niagara." On his flag was inscribed the dying sentence of Lawrence, "Don't give up the ship." He received a gold medal for this victory. He resigned the command to Capt. Elliott, November 20; was appointed a captain September 10, and given command of the "Java," 44. That vessel being blockaded, he was ordered to superintend the construction of a squadron of gunboats. Returning to the "Java," he went to Algiers in Decatur's squadron. In 1819, sailed in the "John Adams" to command the Brazil Station. Sailed up the Amazon River in the schooner "Nonsuch" to Angostura, was attacked with the yellow fever, and died August 23, aged 34 years, on his return to Port Spain, Trinidad.—*F. S. Bassett*, *Lieutenant U.S.N.*

Perseus (named after a mythical hero, the slayer of Medusa). A constellation lying between Auriga and Taurus on its east, and Cassiopeia and Andromeda on its west. Of its two principal stars, *α* lies nearly between Capella and Cassiopeia, *β* forms a triangle with Capella and the Pleiades. *α Persei*, Mirfak. *β Persei*, Algol. The latter star is remarkable for its periodic changes of magnitude.

Personal Error, or Personal Equation. Different individuals have their peculiarities which materially affect the observations made by them. The organ of vision is more refined and specially educated in one person than in another, and the forming a judgment of the exact instant of a phenomenon is greatly influenced by the temperament of the observer. The error arising from this cause is called the *personal error*, or, with reference to the consequent correction to be made to an observation, the *personal equation*. Even when two images in contact are at rest before two observers, one will decide that they overlap, and the other that they are apart; but especially when the images are in motion does such difference of opinion occur. Anxiety lest he should miss the observation may lead a nervous observer to think he sees the contact before it really takes place, while quickness of perception may be deficient in another observer.

Personnel. A word adopted from the French, and expressive of all the officers and men, civil and military, composing an army or a naval force.

Persuader. A rattan, colt, or rope's end in the hands of a boatswain's mate.

Perth, formerly the metropolis of Scotland, is situated on the right bank of the river Tay, in lat. 56° 23′ 50″ N., lon. 3° 26′ 20″ W. The river is navigable to the city for vessels of considerable burden. Ship-building is an extensive interest, and the salmon-fisheries of the Tay are very valuable. The foreign trade is unimportant,

but the coastwise exports include, besides fish, large quantities of potatoes, corn, timber, and slates. Pop. 27,000.

Perturbations. Irregularities or inequalities in the motion of a heavenly body in its orbit.

Peru, Navy of. The list of vessels at present comprises 2 single-turreted monitors, 2 gun-vessels, 1 unarmored corvette, 4 transports, and 3 school-ships. Their most formidable vessel, the "Huascar," was captured by the Chilians, October 8, 1879. The "Atahualpa" and the "Manco Capac" (since sunk by the Chilians at Arica, June 14, 1880) were built for the U. S. navy in 1866, at Cincinnati, O., and sold to Peru in 1867.

The "Victoria" and "Loa" are small gun-vessels, mounting 2 guns each. The unarmored vessels include the wooden corvette "Union" and the transports "Chalco," "Limena," "Oroya," and "Talisman." The "Independencia," lost in 1879 by running on a rock while in chase of the Chilian gunboat "Covadonga," was an iron-armored frigate of the old type, built in England in 1865.

Petard. A bell-shaped vessel filled with powder, and fired by a fuze, formerly used for breaking down gates, barricades, etc. *Hoist by his own petard*, a phrase descriptive of the case of one whose machination against another has re-acted to his own injury.

Pet-cock. A tap or valve on a pump. A faucet on a cylinder.

Peter-boat. A fishing-boat of the Thames and Medway, so named after St. Peter, as the patron of fishermen, whose cross-keys form part of the armorial bearings of the Fishmongers' Company of London. These boats were first brought from Norway and the Baltic. They are generally short, shallow, and sharp at both ends, with a well for fish in the centre, 25 feet over all, and 6 feet beam; yet in such craft boys were wont to serve out seven years' apprenticeship, scarcely ever going on shore.

Peter's-fish. A haddock; so named because the spots on either side are supposed to be the marks of St. Peter's fingers, impressed indelibly when he caught that fish to pay the tribute.

Petrel. The *Cypselli* of the ancients, and *Mother Carey's chicken* of sailors. They collect in numbers at the approach of a gale, running along the waves in the wake of a ship, whence the name *petrel*, in reference to St. Peter's attempt to walk on the water. They are seen in all parts of the ocean. The largest of the petrels, *Procellaria fuliginosa*, is known by seamen as *Mother Carey's goose*.

Petticoat Trousers. A kind of kilt formerly worn by seamen in general, but latterly principally by fishermen.

Petty Average. See AVERAGE.

Petty Officer. A general term, corresponding to *non-commissioned officer* in the army. He holds his position during the pleasure of the appointing authority, which is generally the commanding officer. The master-at-arms is the chief petty officer.

Phalarope (*Phalaropus*). A genus of birds of the family *Lobipedidæ*, having a rather long, slender, weak, straight bill, resembling that of the sandpipers, which, indeed, they otherwise much resemble, although differing in their aquatic habits, the greater part of their time being passed in swimming on the sea, where they seek mollusks and other small marine animals for their food. The gray phalarope breeds only in the Arctic regions, but migrates southward on the approach of winter. It is a beautiful bird, and remarkable for the great difference of its summer and winter plumage, the prevailing tint in winter being a delicate gray, whilst in summer the upper parts exhibit a fine mixture of black, white, and yellow, and the breast and under parts are a reddish chestnut. Its entire length is rather more than 8 inches. The red-necked phalarope breeds in some of the northern Scottish islands, although it is more common in more northern regions. It is rather smaller than the gray phalarope, between which and it Cuvier makes a generic distinction, on account of its sharper and more slender bill. Both are very fearless of man and easily tamed. Their flesh is oily and unpalatable.

Pharos. An island near Alexandria on which a light-house was erected; hence, a name for any light-house.

Phaselus. An ancient small vessel, equipped with sails and oars.

Phases. The different forms which the illuminated disks of the moon and some planets assume in consequence of their being turned at different angles to the observer.

Phecda. The star γ *Ursæ Majoris*.

Phelps, Thomas S., Commodore U.S.N. Born in Maine. Appointed from Maine, January 17, 1840; attached to sloop "Preble," coast of Labrador and Bay of Fundy, March to December, 1840; Mediterranean Squadron, January, 1841, to September, 1843; sloop "Boston," Brazil Squadron, October, 1843, to February, 1846; Naval School, February to July, 1846.

Promoted to passed midshipman, July 11, 1846; sloop "Boston," Gulf Squadron, October 5, 1846; wrecked on the island of Eleuthera, West Indies, November 16, 1846; detached and ordered to steamer "Polk," for war and special service; in Mexico, February 20, 1847; returned detached, and ordered to coast survey, May 7, 1847; attached to schooners "Nautilus," "J. T. Mason," and steamer "Legare," until June, 1849; razee "Independence," Mediterranean Squadron, June, 1849, to December, 1850; frigate "Constitution," same squadron, December, 1850, to February, 1851; schooner "Graham," steamers "Legare" and "Hetzel," coast survey, May 1, 1851, to November, 1852; receiving-ship "Pennsylvania," November, 1852, to January 1, 1853; steamer "Fulton," one month,—rejoined "Pennsylvania," and attached until December, 1853; surveyed Elizabeth River and Norfolk Navy-Yard; sloop "Decatur," Pacific Squadron, December, 1853, to April 15, 1857; served throughout the Indian war in Washington Territory, 1855–56.

Promoted to master, March 1, 1855.

Commissioned as lieutenant, September 14, 1855; battle of Seattle, Washington Territory, January 26, 1856; ordnance duty, Norfolk, Va., May, 1857, to September, 1858; Paraguay Expedition and Brazil Squadron, September, 1858, to June, 1859; steamer "Crusader," Home Squadron, June 16 to August 24, 1859; commanded steamer "Vixen," coast survey, and on special service, August, 1859, to September, 1861; attached to expedition for the relief of Fort Sumter,

March, 1861. "In organizing the government for war, it was decided by the chiefs of departments that one naval officer skilled in surveying should be detached for special service to co-operate with army and navy, and Lieut. Phelps was selected by ballot for that duty." In consequence of the destruction of signs, boats, buoys, and ranges, and the erection of heavy batteries by the rebels, the Potomac River was rendered almost impassable, and at this critical moment when the safety of Washington was hazarded, a survey and chart of the river became imperative. For this purpose, 6 steamers were placed at the disposal of Lieut. Phelps. Selecting two, he, in June, successfully executed the work, which fully answered the requirements of the country. Transferred to steamer "Corwin" for secret service, September 24, 1861; examined five of the inlets of North Carolina, and surveyed and buoyed Hatteras Inlet, for the introduction of expeditions into the interior waters of that State; skirmished with rebel gunboats, Pamlico Sound, November 9, 1861; engagement with rebel gunboat "Curlew," Hatteras Inlet, November 14, 1861; received compliments of Secretary of Navy; secret service in Virginia waters, December, 1861; attached to North Atlantic Blockading Squadron, March, 1862; assigned to command of division for operations in rear of Gloucester Point, Va., April 1, 1862; York River, April 21, three engagements with Yorktown and Gloucester Point batteries; skirmish with rebels, Queen's Point, Va., captured 5, and caused the destruction of 2 of the enemy's vessels; prevented destruction of White House bridge, May 4, 1862; frequent skirmishes with main body of rebel army retreating from Yorktown, May 5 and 6; battle of West Point, Va., ascended the Mattapony River and prevented the junction of a large force of rebels with main army, May 7; made reconnoissance charts of Mattapony and Pamunkey Rivers.

Commissioned as lieutenant-commander, July 16, 1862. In obedience to the demands of Congress and an order of the Navy Department, executed a close and complete survey of the Potomac River; opposed in the work by enemy's infantry and artillery, July 29, 1862, to March 1, 1863; commanded steamer "Corwin," on special service, from March, 1863, to December, 1864,—principally employed in making surveys in anticipation of naval and military movements, and in examining dangers in the way of blockaders and transports; ironclad "Saugus," December, 1864; steam-sloop "Juniata," January 3, 1865; commanded the "Juniata" at the capture of Fort Fisher, January 15, 1865; South Atlantic Blockading Squadron, January 21, 1865; commanded steamer "Lenapee," Atlantic Coast Squadron, March 2, 1865, to April 3, 1867.

Commissioned as commander, August 5, 1865; Mare Island Navy-Yard, Cal., 1867–70; commanding receiving-ship "Independence," 1870–71; commanding steam-sloop "Saranac," North Pacific Station, 1871–72.

Commissioned as captain, June 19, 1871; navy-yard, Mare Island, Cal., 1873–77; commanding receiving-ship "Independence," 1877–79.

Commissioned as commodore, January 13, 1879; waiting orders, 1880.

Philadelphia, the second city of the United States and the metropolis of Pennsylvania, is situated on the Delaware River, 96 miles (by ship-channel) from the ocean. The water front on the Delaware reaches from Poquessing Creek to Bow Creek, opposite Tinicum Island, and is 23 miles long. The area of the city, including Germantown, Chestnut Hill, Frankford, Manayunk, and many smaller suburban towns, is 129 square miles. The city is divided into two parts by the Schuylkill River, that part lying west of the river being called West Philadelphia. The principal government buildings located here are the Naval Asylum, naval hospital, Frankford and Schuylkill arsenals, custom-house and sub-treasury, and post-office. The navy-yard is situated at League Island, south of the city, and at the end of Broad Street, about 5 miles from Market Street. The city is accessible from the sea by the largest merchant steamers, and several lines of steamships ply between Philadelphia and European ports. A number of large railroads centre here, and the city takes a high rank as a seat of foreign, domestic, and coastwise trade; coal, petroleum, live-stock, lumber, grain, iron and iron goods, machinery, cotton (raw and manufactured), and tobacco are the leading articles of export. Girard Point, on the Schuylkill, is the grain and provision shipping-point. Port Richmond, on the Delaware, is the coal port, and Gibson's Point, on the Schuylkill, and Greenwich Point, on the Delaware, have all the necessary appliances for the shipment of both petroleum and coal. The only transatlantic line of steamers carrying the American flag plies between Liverpool and Philadelphia. The manufactures of this city constitute its largest business interest. Some idea of its vastness can be formed from the following figures: The amount of capital invested is $250,000,000; number of hands employed, 220,000; amount paid in wages, $88,000,000, and the value of a year's product, $500,000,000. The textile interests employ more than 70,000 persons, and produce more than $85,000,000. The other leading manufactures are iron and steel, machinery, refined sugar, house-building materials, boots and shoes, etc. The population by the census of 1880 is 847,572.

Phinak. A species of trout.

Phœnix (named after a mythical bird of the Egyptians). A constellation the principal star of which, *α Phœnicis*, is situated midway between Fomalhaut and Achernar, nearly on the line joining them.

Physalia. A genus of *Acalephæ.* Under the name of *Portuguese man-of-war* this creature is well known to sailors, with whom it is a common trick to induce a green hand to pick up one of them for the fun of witnessing the promptitude with which he lets go of it, owing to a power it possesses of inflicting a sting that not only causes severe local pain, but also constitutional irritation.

Piaba. A small, fresh-water fish of Brazil, about the size of a minnow, much esteemed for food.

Piccaroon. A swindler or thief. Also, a piratical vessel.

Piccary. Piratical theft on a small scale.

Pickerel. A fish of the genus *Esox*, applied to several species of fresh-water fish belonging to the pike family.

Pickerie. An old word for stealing; under this name the crime was punishable by severe duckings.

Pickering, Charles W., Commodore U.S.N. Born in New Hampshire, from which State he was appointed midshipman, May 22, 1822. In 1822–23, sloop "Cyane," stationed on the coast of Africa, lost by fever 50 of her officers and crew. On leave, 1824–26; Naval School, New York, 1827; in 1828, attached to sloop-of-war "Erie," West India Station; from the summer of 1831 to February, 1834, was attached to the sloop-of-war "Falmouth," Pacific Squadron.

Promoted to passed midshipman, June, 1833; serving at navy-yard, Boston, during the years 1835–36; from 1837–39, attached to frigate "Fulton," stationed on the U. S. coast.

Commissioned as lieutenant, December 8, 1838; from 1840–42, attached to sloop "Yorktown," Pacific Squadron; from 1844–45, executive-officer of the sloop "Preble," West India and African Squadrons; attached to navy-yard, Portsmouth, N. H., 1846–47; in 1848–49, attached to sloop-of-war "St. Mary's," Pacific Squadron; commanding the sloop-of-war "Warren," Pacific Squadron, during the years 1850–51; in 1854, served as executive-officer of the sloop "Cyane," which vessel took out the Darien Expedition under Lieut. Strain, who lost 7 of his men by starvation. Lieut. Pickering, in his search for that party, was within 4 hours' march of the head-waters of the Chaquenaque, the course of which it was his intention to follow, when he was apprised by Indian runners of the arrival of Lieut. Strain and party at Chapagana, Pacific side. After landing Lieut. Strain with the remainder of his party at New York, the "Cyane" was ordered to Greytown, Nicaragua, which town, in pursuance of redress, was reduced to ashes after a bombardment of 4 hours; only one house was left standing. In 1855–57, attached to navy-yard, Portsmouth, N. H.

Promoted to commander, September 14, 1855; in 1859–61, inspector of the seventh light-house district, headquarters at Key West.

Commissioned as captain, July 15, 1862; in 1862–63, commanding steam-sloop "Kearsarge," Mediterranean and Western Islands; in 1863–64, commanding steam-sloop "Housatonic," which was blown up off Charleston on the night of February 17, 1865, by a submarine torpedo. As soon as recovered from wounds received on board the "Housatonic," took command of the steamer "Vanderbilt," which vessel participated in the capture of Fort Fisher. Detached from "Vanderbilt" in August, 1865, and ordered to Portsmouth Navy-Yard; detached from Portsmouth Navy-Yard, February, 1867, when he was placed upon the retired list at his own request.

Commissioned as commodore in 1871.

Pickle-harin. A sea-sprite.

Pickling. A mode of salting naval timber in dock-yards, to insure its durability.

Pictarnie. A name for the *Sterna hirundo*, tern, or sea-swallow.

Pictor. See CONSTELLATION.

Pictou, Nova Scotia, is situated at the head of Pictou harbor, which opens into Northumberland Strait. The annual export of coal from this place is very large, and considerable building-stone is also shipped from here. The harbor is one of the finest on the Gulf of St. Lawrence, and the town is very well built, and contains several tanneries, saw-mills, iron-foundries, carding-mills, and tobacco-factories.

Piece of Eight. The early name for the coin of the value of 8 reals, the well-known Spanish dollar.

Pier. A mole or jetty extending out in the water, for the convenience of vessels receiving and landing cargo or passengers. A pillar supporting a bridge.

Piggin. A little pail having a long stave for a handle; used to bail water out of a boat.

Pig-tail. The common twisted tobacco for chewing.

Pig-yoke. A familiar name for a quadrant or sextant.

Pike. A fish of the genus *Esox*, so named from its length and shape, or from the form of its snout. It is a fresh-water fish, living in deep water.

Pilchard. A fish of the genus *Clupea*, resembling the herring, but thicker and rounder, having the under jaw shorter, the back more elevated, and the belly not so sharp. These fishes are caught on the Cornish coast, in England, about the middle of July, in immense numbers, and furnish a considerable article of commerce.

Pile. A spar pointed at one end and driven into soil to support a superstructure.

PILE-DRIVER. A machine adapted for driving piles. Also, applied to a ship given to pitch heavily in a sea-way.

Pillar of the Hold. A main stanchion with notches for descent and ascent.

Pillaw. A dish composed of junk, rice, onions, and fowls; it figured at the marriage feast of Commodore Trunnion. It is derived from the Levantine *pillaf*.

Pillow. That part of a pillow-block or bearing which contains the lower brass of a journal. A block of timber upon which the inner end of the bowsprit was formerly supported.

PILLOW-BLOCK. See PLUMBER-BLOCK.

Pilot. A person specially deputed to conduct ships into and out of port, along the coast, and in other places where navigation is dangerous. The intricacy of almost all coast navigation renders it impossible that any navigator, however skillful, can be acquainted with all the waters to which he may have to sail his ship; the risk of accident, through ignorance of local danger, is avoided by taking a pilot. The pilot, to whom so much is intrusted, must be a person competent and reliable, and all maritime countries grant licenses to qualified seamen to act as pilots in a certain district. Pilots are associated in companies, the profits being distributed according to local regulations. Pilots are sometimes found at a distance of several hundred miles from port; their boats are distinguished by a flag, and by a number painted conspicuously on the sails. Pilot regulations vary in different ports; in some, pilotage must be paid whether a pilot be taken or not; in others, the employment of a pilot is optional with the master of the vessel. It is the practice in the navy to employ a pilot, even when the commanding officer and navigator are familiar with the local dangers, the object being to assist the pilots in maintaining an effective force.

PILOTAGE. The compensation allowed to a pilot.

PILOT-BOAT. A handy sharp-built boat used by pilots.

PILOT-BIRD. A bird of the Caribbee Islands,—so called because its presence indicates to mariners the vicinity of land.

PILOT-BREAD. Sea-biscuit; hard bread.

PILOT-CLOTH. A heavy cloth used for pea-jackets.

PILOT-FISH. A fish of the family *Scomberidæ*, in shape very similar to the mackerel. It is about a foot in length, the color being a silvery grayish blue, with fine dark blue bands passing around the body; its flesh is delicate and resembles the mackerel in flavor. It is supposed to be the Pompilius of the ancients, which was believed to point out the desired course to sailors. It is often seen in company with a shark, and is therefore very commonly supposed to direct the shark to its prey. Concerning this many stories are told by both navigators and naturalists. On the other hand, it has been contended that the pilot-fish merely follows the ship to feed on whatever may be thrown overboard; or that it attends the shark in order to seize small morsels of its large prey.

PILOT-WATER. The limits within which usage or law requires a ship to pay pilotage.

Pinch-bar. A lever with a fulcrum close to the point; it is used in moving very heavy articles.

Pinching-pin. A pin used to keep a slide-valve from rising off its seat.

Pinion. The smaller of two toothed wheels in gear, used as a driver to diminish speed, and as the driven to increase speed; and with a rack to convert rotary motion into rectilinear, or *vice versa*.

Pink. A ship with a very narrow stern, having a small square part above. The shape is of old date, but continued, especially by the Danes, for the advantage of the quarter-guns, by the ship's being contracted abaft. Also one of the many names for the minnow,—so called from the color of its abdomen in summer.

PINK-STERNED. Having a very narrow stern.

Pinnace. Originally a small vessel propelled by sails and oars, usually schooner-rigged, and employed as a tender to large vessels. The armed pinnace of the French coast was of 60 to 80 tons burden, carrying one long 24-pounder and 100 men. The name is now given to a double-banked carvel-built row-boat, and is also applied to a person of low habits.

Pin-rail. A timber bolted to the interior of the bulwarks at a convenient distance from the deck, and having a number of belaying-pins to which the running rigging is secured.

Pintail, or Pintail Duck. A duck about the size of the mallard, with a brown head and tapering tail. It is found in all polar regions, and migrates southward during winter.

Pintle. A composition bolt having straps attached to secure it to the rudder; the bolt rests in the braces fixed upon the stern-post.

Pipe. A tube to convey steam, water, or other fluid. A boatswain's call. To wind a boatswain's call. *To pipe the eye*, to weep.

PIPE-COUPLING. An adjustable joint for the convenience of taking down pipe or renewing portions.

Pipe-clay. A substance used for whitening the belts of the marines. It should be free from iron.

Pipe-fish. A genus of osseous fishes of the order *Lophobranchii* and of the family *Syngnathidæ*. The form is elongated, there is little flesh, and the body is almost covered with partially ossified plates. The males have pouches in which they receive the eggs of their mate, and carry them till they are hatched. They are commonly 12 to 16 inches in length. The name is sometimes given to the *flute-mouths*.

Piper. A half-dried haddock. The shell *Echinus cidaris*. Also, the fish *Trigla lyra*.

Piracy. See INTERNATIONAL LAW, 8.

Piragua. See PIROGUE.

Pirate. One who traverses the seas for the purpose of robbing; a freebooter. The vessel of such a rover is also called a pirate. The pirate is the enemy of mankind, and is punishable under the law of nations by any competent tribunal in any country where he may be found or into which he may be brought. The armed cruisers of all nations are bound, in the common interest of humanity, to attack and capture or destroy him. A distinction is to be observed between the pirate recognized as such by the law of nations and one made such by the municipal law of individual states. Of the former it may truly be said, "his hand is against every man, and every man's hand is against him;" but the latter may be innocent of any offense against public law, and yet be amenable to the pains and penalties of piracy under the municipal law of his own country. See INTERNATIONAL LAW, 8.

Pirie. An old term for a sudden gust of wind.

Pirogue, or Piragua. A canoe formed from the trunk of a large tree, generally cedar or balsa wood. It was the native vessel which the Spaniards found in the Gulf of Mexico, and on the west coasts of South America; called also a *dug-out*.

Piscary. A legal term for a fishery. Also, a right of fishing in the waters belonging to another person.

Pisces. The twelfth sign of the zodiac. A constellation to the eastward of Pegasus, without any notable stars.

Piscis Australis (*Lat.* "The Southern Fish"). A constellation to the south of Aquarius, containing the brilliant star called *Fomalhaut*. A line through β and α Pegasi, continued a little more than twice their distance, gives the position of α *Piscis Australis*, or *Fomalhaut*.

Piscis Volans. See CONSTELLATION.

Pistol-proof. A term for the point of courage for which a man was elected captain by pirates.

Piston. A cylindrical piece of mechanism which fits the cylinder of a steam-engine or pump and is capable of reciprocation, and in the former case is the means of converting pressure into rectilinear motion, the action being reversed in the case of the pump; that is, in the one case the fluid gives motion to the piston, and in the other the piston gives motion to the fluid.

PISTON-HEAD. The body of a piston on which the packing-rings and springs rest.

PISTON-HEAD VALVE. A valve in the head of a piston; usually to admit steam to the inside of the piston to press out the packing-rings in case of steam-packing.

PISTON-PACKING. Means of preventing the leakage of steam, water, etc., between the piston and the cylinder in which it works; in the steam-engine it is usually composed of metallic rings; in pumps, braided hemp, cotton, and wire are common, as well as many patented kinds.

PISTON-ROD. The rod connecting the piston

to the cross-head, or, as in the case of the oscillating-engine, to the crank-pin.

PISTON-VALVE. A cylindrical slide-valve (not rotary); either a solid or packed piston may be used, and there is usually one for each end of the cylinder. They act by sliding back and forth over the parts, admitting steam from between them and exhausting beyond them.

Pitch. The distance between the centres of two adjacent threads of a screw, measured axially, or the distance that a screw will advance into a nut during one revolution; the term applies to the screw-propeller, the propelling surface of which is helicoidal, being composed of fractions of two or more threads. The *pitch* of rivets, boiler-stays, and the teeth of wheels is the distance between centres; in the latter case it includes a tooth and a space.

Tar and coarse resin boiled to a fluid yet tenacious consistence. It is used in a hot state with oakum to fill the chinks or intervals between the planks of a vessel.

PITCH-BOAT. A vessel fitted for boiling pitch in, which should be veered astern of the one being calked.

PITCH-CIRCLE. The circle on which the teeth of a wheel are laid out, and the rolling action of which would be equivalent to that of the wheel itself; the angular velocity ratio of two wheels working together is the same as that of their pitch-circles rolling in contact.

PITCH-MOP. The implement with which the hot pitch is laid on to ship's sides and perpendicular work.

PITCH-PINE. *Pinus resinosa*, commonly called Norway or red pine.

Pitching. The plunging of a ship's head in a sea-way; the vertical vibration which her length makes about her centre of gravity,—a very straining motion.

Pit-fish. A small fish found in the Indian seas, which has the power of protruding or retracting its eyes.

Pit-pan. A flat-bottomed, trough-like canoe, used in the Spanish Main and in the West Indies.

Pit-powder. Powder made with charcoal which has been burned in pits, not in cylinders.

Pivot-bolt. A bolt confining either end of the slide of a pivot-gun to the deck. One of the bolts being removed, horizontal motion can be given, the other bolt acting as the axis.

Pivot-gun. A gun capable of being fired on either side of the ship, the after part of the slide being confined to the deck by a pivot-bolt.

Pizarro, Francisco, the conqueror of Peru, was an illegitimate son of Gonzalo Pizarro, a colonel of infantry. He was born at Truxillo, in Estremadura, Spain, about 1471. In his youth he was a swineherd, but abandoning this uncongenial occupation, he went to the port of Seville and there embarked to seek his fortune in the New World. He was in Hispaniola in 1510; afterwards joined Balboa, and was with him when he crossed the Isthmus of Panama. In 1515 he was principally engaged in traffic with the natives on the shores of the Pacific Ocean. Hearing of the splendid achievements of Cortez, and rumors of the existence of a very rich country in the south reaching him, he formed a copartnership with Diego de Almagro and Hernando Luque, and the three fitted out a small expedition, with Pizarro in command. In November, 1524, he set sail, but got no farther than Quemada Point. On his second expedition he discovered Peru, but returned to Panama for volunteers to conquer the country; failing to do so here, he returned in 1528 to Spain, and by his graphic descriptions of the wealth of the new territory he secured from Charles V. the right of the discovery and conquest of Peru, and various honorable titles, such as governor and captain-general of Peru. On his side he agreed to raise a certain number of followers, and to give to the crown of Spain one-fifth of all treasures he should obtain. He returned to Panama, and with a small but well-equipped force of 180 men he conquered and made the empire of Peru his own. His conquest of Peru is a drama in every act of which there is bloodshed, and the final act (June 26, 1541), in which he and his group of followers fell the victims of a conspiracy, shows the drama to have been consistent to the end.

Pizarro, Gonzalo, like his brother, was also illegitimate. He was a soldier at an early age, and distinguished himself by his skill in martial exercises; and when he joined his brother's expedition, in 1528, to Peru, he was considered the best lance in the troop. The territory of Quito was assigned to him by his brother, and he was enjoined to explore the land to the east. He started on his famous journey in 1540, at the head of 350 Spaniards and a great number of Indians. They reached and crossed the Andes, losing a great many lives, the cold rendering many of them helpless. On the eastern side of the Andes they discovered the Land of Cinnamon. Hearing of a land of gold 10 days distant, they resolved to go there. After the greatest difficulties, and nearly starving to death, they reached the Napo, an affluent of the Amazon. Here Pizarro caused a rude bark to be constructed to transport the baggage and sick travelers, and intrusted Francisco de Orellana with the command of the vessel, and ordered him to proceed to the confluence of the Napo and Amazon, where a rich nation was supposed to live, and to obtain supplies from them and return to him. Orellana reached the Amazon, but, unable to obtain supplies or return against the current, he sailed down the Amazon to the Atlantic, and, strange to say, was successful in reaching Spain. Pizarro, after waiting in vain for the return of the bark, returned to Quito, where he arrived in 1542, after an absence of two years, the hero of an expedition which stands unrivaled in the annals of American discovery for its dangers and sufferings, and for the heroic fortitude with which they were endured. After the death of Francisco, Gonzalo became captain-general of Peru, and he was afterwards defeated in battle and executed by Pedro de la Gasca, who had been invested with the powers of sovereign by the king of Spain.

Place. The *place* of a heavenly body is the point on the celestial sphere to which it is referred by a spectator; when the spectator is supposed to be at the centre of the earth, this point is called the *geocentric* place; when at the centre of the sun, the *heliocentric* place. The *apparent* place is the point to which a heavenly body is referred by a spectator on the surface of the earth, viewing it through the atmosphere; the *true* place is the point to which it would be referred by a spec-

tator at the centre of the earth, viewing it through a uniform medium. The apparent place is determined by observation; the true place is obtained by applying to the apparent place the corrections for parallax and refraction. These corrections are greatest when the body is in the horizon, and decrease as it approaches the zenith.

Places of Call. Merchantmen must here attend to two general rules: if these places of call are enumerated in the charter-party, then they must be taken in the order laid down; but if leave be given to call at all, or any, then they must be taken in their geographical sequence.

Plaice, or Plaise. A fish of the genus *Platessa* (*Pleuronectes* of Linnæus), allied to the flounder, and growing to the size of 8 or 10 pounds or more.

Plan. A perfect outline of the ship to be built. There are three principal plans, viz., the *sheer*, *half-breadth*, and the *body-plan*, besides which there are deck-plans, and plans of such details as are necessarily used in the construction. The *sheer-plan* shows the sheer of the ship, shape or outline of the head, stern, and keel; when drawn in sections, as it usually is, it shows the heights of all the decks and the general arrangement of all the rooms in profile; it also shows the section-lines, the location and rake of the masts and bowsprit, the location of the frames, keelson, deadwood, air-ports, scuppers, chain-plates, etc. The rudder and propeller in elevation, and all vertical objects coming into the design, are shown in the sheer-plan. The *half-breadth plan* shows the outline or shape of the rail, plank-sheer, water-lines, diagonal lines, and ribband-lines in half breadth, and the location of the frames and section-lines. The *body-plan* shows the shapes of the frames or the vertical sections, as well as the cants; and all other frame-lines are drawn to their shape in the body-plan; it has the water-lines, section-lines, sheer-lines, and diagonal lines drawn upon it. The *deck-plan* shows the general arrangement of the hatches, beams, knees, and houses to be placed upon the deck; it gives the horizontal outline.

Plane Sailing. The method of calculating the position of a ship and the course to be steered, which is founded on the supposition that the surface of the earth is a plane. The method is simple and easy when compared with *spherical* sailing, and the term *plane sailing* has come to denote anything that is easy of accomplishment. It is frequently improperly written *plain* sailing. See NAVIGATION.

Planets (Gr. *astēr planētēs*, a wandering star, from *planān*, to wander). This term originally described all the heavenly bodies which were observed to change their place on the celestial sphere, in contradistinction to those whose position appeared to be fixed. The word, however, is now technically restricted to indicate those moving bodies of a character similar to our own globe, which revolve in orbits about the sun of our system. They shine by the reflection of light received from the sun. The principal planets, in the order of their distances from the sun, with their symbols, are Mercury ☿, Venus ♀ (the Earth ⊖, ⊕, or ♁), Mars ♂, ... Jupiter ♃, Saturn, ♄, Uranus ♅, Neptune ♆. Besides these, near to the sun is a small planet named Vulcan, and between Mars and Jupiter is a group of minute planets, called the *asteroids*, *planetoids*, or *minor planets*. The paths of the principal planets are in planes making a small angle with the plane of the ecliptic.

To the practical navigator the actual dimensions and movements of the planets are not so important as the conspicuous phenomena they exhibit. Four of them—Venus, Mars, Jupiter, and Saturn—are remarkably large and brilliant bodies, and of great importance in the problems of navigation; another, Mercury, is also visible to the naked eye as a large star, but by reason of its propinquity to the sun, is seldom conspicuous; Uranus is barely discernible without a telescope; the rest are never visible to the naked eye. Observations of Venus and Jupiter may often be obtained in the daylight, even when the planets are invisible to the naked eye. In such cases their meridian altitude may sometimes be observed with advantage. It is first approximately computed,—the corrections for refraction, dip, and index-error being applied reversely; this angle is then set on the sextant, the inverting telescope being screwed close down to the plane of the instrument. The image of the planet will be by this means detected near the N. or S. point of the horizon, and, once found, its meridian altitude may be accurately observed. These two planets are seen very distinctly during twilight, and this is the best time for observing them, for then the horizon is in general clearly visible and strongly marked. The four planets, Venus, Mars, Jupiter, and Saturn, are used for determining the longitude by the method of "lunar distances." It is, therefore, important to know how to identify these bodies. They are collectively distinguished from the fixed stars by their shining with a steady light, instead of twinkling. By reason of their proper motion they are continually shifting their place, and cannot be connected by imaginary lines with other heavenly bodies, as in the case of the fixed stars. Their positions may be found by referring to the Nautical Almanac, which gives their right ascension, declination, and time of Greenwich meridian passage. The appearance of the body may also help to distinguish it; Venus has a bluish light, while Mars is of a red color. For further information, see under proper heads.

PLANETS, INFERIOR AND SUPERIOR. Those planets whose orbits are within that of the earth are called *inferior* planets; those whose orbits are without, *superior* planets. The inferior planets are Vulcan, Mercury, and Venus; the superior planets are Mars, the asteroids, Jupiter, Saturn, Uranus, and Neptune.

PLANETS, PRIMARY AND SECONDARY. In the solar system there are about 20 moons or satellites; these are sometimes called *secondary* planets, the bodies about which they revolve being distinguished as *primary* planets.

PLANETS, INNER AND OUTER GROUP OF. The planets whose orbits are within the asteroids are designated as the *inner* group, the others the *outer* group.

PLANETS, MINOR. As soon as the planetary distances were determined, astronomers saw that to the orbit of Mars distances increase in a somewhat regular order, and that between Mars and Jupiter a wide gap destroys the symmetry otherwise apparent. Kepler suggested that a new planet might be found in this space.

Titius, of Wittenberg, sought for a simple

series of numbers which should represent the relative distances of the planets from the sun. After many trials he took the series—

0, 3, 6, 12, 24, 48, 96, etc.,

in which each term after the second is twice the preceding term; adding 4 to each number he found numbers which indicate very nearly the relative distances, thus:

Mer.	Ven.	Earth.	Mars.	——	Jup.	Sat.
4,	7,	10,	16,	28,	52,	100, etc.

When Herschel discovered Uranus, its distance was found to correspond to the next number, 196; but a planet was still wanting whose distance should answer to the number 28. The series of Titius was reproduced by Bodé, and was long known as *Bodé's law*.

By the series the distance of Neptune should correspond to the number 388; it is 300, and here the law fails. The gap at 28 has been filled by the discovery of a number of small bodies, the largest of which is but 300 miles in diameter. The first was discovered in 1801, but they now number more than a hundred, and they are called *asteroids* (star-like), *planetoids* (planet-like), and *minor planets*. They are invisible to the naked eye, and are known to be planets only by their motion; their orbits are very eccentric, much inclined to the ecliptic, and are included in a broad ring at a mean distance of 254 millions of miles from the sun. It has been suggested that they are the fragments of a planet shattered by an explosion, or broken in pieces by collision with a comet. The nebular theory supposes that the planets were formed originally by the gathering of matter collected by gravitation; that while the matter in the case of Mars and Jupiter concentrated about one nucleus, that which formed the minor planets gathered about many centres, and that these small bodies take the place of the one large body which might have been formed had all been compacted into one. The discoverers of minor planets assigned to them the names of mythological goddesses. They are also designated by numbers denoting the order of their discovery; thus, Ceres is (1), Psyche (16), etc.

Plank. A broad piece of timber from 1½ to 8 inches in thickness. *To plank it*, to sleep on the bare deck; to walk the deck.

PLANKING. The planks used in covering the frame of a ship. The act of covering the frame of a ship with plank.

PLANKING-CLAMP. An iron tool made for the purpose of drawing plank up to the timbers. It is a thin bar of iron bent so as to be open upon one side. On one end of this bar is fixed a point or claw for insertion into the timber, on the other end is a powerful screw having a lever attached to the outer end.

PLANK-SHEER. The pieces of plank laid horizontally over the timber-heads at the top-heights for the purpose of covering the top of the sides. It is sometimes called the *covering-boards*.

Plant. The machinery, fixtures, etc., by which a business or manufacture is carried on.

Planter. A large snag in a river, the upper end of which is below the surface of the water. In Newfoundland, a person engaged in the fishery.

Platanist. A fish of the genus *Delphinus* (*D. Gangeticus* of Cuvier); a species of dolphin found in the Ganges.

Play. Scope; swing; freedom of movement to a certain extent. *Tp play*, to put in action. *In play*, in action.

Playte. An old term for a river-boat.

Plebe. A fourth classman at the naval or military academy.

Plectognathi. An order of fishes having the maxillary bones stiffly adhering to the sides of the intermaxillaries, which alone form the jaws, as the file-fish. Written also *plectognaths*.

Pledget. A string of oakum used in calking.

Pleiades. A noted cluster of stars in the neck of Taurus. Six stars may be easily counted, and some persons distinguish as many as 12 or 14. The telescope shows about 100. The largest star, Alcyone, is near the ecliptic. Certain theorists have supposed that the centre of the universe is in this star, and that the solar and stellar systems revolve about it. The Greeks called this group the Pleiades (*plein*, to sail), because it was visible during the months when the Mediterranean was navigable without danger.

Pleny Tides. Full tides.

Plesiosaurus (Gr. *plēsios*, near; *sauros*, a lizard). A genus of fossil sea-reptiles, the remains of which are found in the Lias, Oolite, and Cretaceous measures. Its remarkable character may be inferred from the description of it given by Buckland, as follows: "To the head of a lizard it united the teeth of a crocodile, a neck of enormous length, resembling the body of a serpent, a trunk and tail having the proportions of an ordinary quadruped, the ribs of a chameleon, and the paddles of a whale."

Plicatiles. Ancient vessels built of wood and leather, which could be taken to pieces and carried by land.

Plot. To delineate, to mark down; as, to plot a ship's position.

Plucker. The fishing frog, *Lophius piscatorius*.

Plug. An implement for stopping leaky boiler tubes. The revolving part of a gauge-cock. A piece of metallic alloy which fuses at a low temperature, placed in the bottom of a boiler to melt and let the water run out in case the boiler is overheated. Any conical piece of wood to fit in an orifice. See SHOT-PLUG.

PLUG-HOLE. A hole in the bottom of a boat for convenience in letting out water; the plug is taken out when the boat is hoisted, and put in before lowering.

Plug-rod. A rod from the beam of an engine to work the air-pump, and sometimes communicates motion to the valve-gear; the term is not now in common use.

Plumb. Vertical; perpendicular.

Plumber-block, or Pillow-block. That portion of the engine frame supporting the main-journals, and containing the brasses.

Plummer-block. An adjustable pillow-block.

Plunger. A long, solid, or hollow cylinder, employed as a piston in force-pumps; its action is by displacement entirely.

Plunging Fire. A pitching discharge of shot from a higher level, at such an angle that the shot do not ricochet.

Ply. To work to windward; to beat.

Plymouth. A naval station and seaport town

of England, in the county of Devon, between the rivers Plym and Tamar, at the head of Plymouth Sound. The principal buildings in the town are the royal hotel, royal union baths, custom-house, barracks, hospitals, etc. The structures connected with the naval establishments are outside the town. The principal dock-yard is at Devonport. In it is an observatory. The naval and royal military hospitals, the victualing-yard, the gun-wharf, and the military prison, are all fine stone edifices. The harbor of Plymouth is double, consisting of the mouth of the Tamar and the estuary of the Plym. The parts of the port appropriated to the mercantile shipping are called Sutton Pool and Mill Bay, and in the latter are extensive wet-docks. The city has a large trade, and imports from the West Indies, North America, and the Baltic. It has also manufactures of glass, soap, starch, etc., and extensive fisheries. Pop. 69,000.

Pochard (*Fuligula*). A genus of oceanic ducks, the species of which are numerous, some of them are natives of the Arctic regions; some are found, at least in winter, on the coasts of Europe, Asia, and North America, and some in the southern hemisphere. The bill of the pochard is about equal in length to the head, and is broad and flat, a little dilated toward the tip, the lamellæ of the upper mandible not projecting beyond the margin; the wings are short, and the tail short and rounded. The windpipe of the male in all the pochards terminates in a labyrinth composed partly of bone and partly of membrane. The canvas-back duck is a species of pochard.

Pocket. A bight on the coast in which ships are likely to be detained by head winds.

Pod. A company of seals or sea-elephants.

Podiceps. Synonymous with *grebe* (which see).

Poggie. The miller's thumb, *Cottus cataphractus.*

Pogonias. See DRUM-FISH.

Pohagen. A fish of the herring kind; called also *hard-head.*

Point. A low spit of land projecting into the sea. *To point a gun*, to direct it at the target. *To point a rope*, to unlay, taper, and weave some of the outside yarns of the end of a rope,—for neatness, to prevent fagging out, and for convenience in reeving through a block. See COMPASS, REEF-POINT.

Point-blank. The term *point-blank* originated when it was supposed that a shot traveled for a certain distance in a straight line. The French define the point-blank as the second point at which the line of sight intersects the trajectory; the distance of this point from the muzzle is the *point-blank range.* The *natural* point-blank corresponds to the natural line of sight; all others are *artificial* points-blank. With us, as in England, the point-blank range is the distance from the muzzle to the point at which the projectile first strikes the horizontal plane on which the trucks of the carriage rest, the gun being laid level.

Point De Galle Canoe. A canoe consisting of a single stem of *Dúp* wood, 18 to 30 feet long, from 1½ to 2½ feet broad, and from 2 to 3 feet deep. It is fitted with a balance-log at the ends of two bamboo outriggers, having the mast, yard, and sail secured together, and when sailing is managed in a similar way to the catamaran. They sail very well in strong winds, and are also used by the natives of the Eastern Archipelago, especially at the Feejee group, where they are very large.

Pointer-board. An old contrivance for training a ship's guns.

Pointers. The two stars α and β *Ursæ Majoris* are called the *pointers* because they point out Polaris, which lies about as far from α as α does from η, the extreme star in the tail of the Great Bear.

Polacre. A ship or brig of the Mediterranean. The masts are commonly formed of one spar from truck to heel, so that they have neither tops nor cross-trees; neither have they any foot-ropes to their upper yards, because the men stand upon the topsail-yards to loose and furl the topgallant-sails, and upon the lower yards to loose, reef, or furl the topsails, all the yards being lowered sufficiently for that purpose. Written also *polacca.*

Polar. Pertaining to, surrounding, or proceeding from, the pole.

POLAR ANGLE. On the terrestrial sphere, the angle at the pole formed by two meridians; on the celestial sphere, the angle at the pole formed by two hour-circles.

POLAR AXIS. The axis of an astronomical instrument, as an equatorial, which is parallel to the axis of the earth.

POLAR CIRCLES. The two parallels of latitude which are at a distance of 23° 28′ from the poles; they separate the frigid from the temperate zones. The northern is called the *arctic*, and the southern the *antarctic* circle.

POLAR CO-ORDINATES. See CO-ORDINATES.

POLAR DISTANCE. The angular distance from the elevated pole,—the complement of the declination.

POLAR EXPLORATION. The list of explorers in the Antarctic regions may be reckoned up upon the fingers, while Arctic exploration has called forth the energies of stout hearts and active minds for more than a thousand years. After the discovery of the sea-routes to the Pacific and Indian Oceans, by the way of Cape Horn and the Cape of Good Hope, there was no practical object to be gained in pushing for the south pole, while exploration in that direction is attended by greater difficulties and infinitely greater dangers than in the Boreal region. Expeditions to the south have therefore been undertaken purely in the interests of science, and not, as was long the case with northern exploration, in hopes of finding a short cut to the Indies, and to wealth.

The Arctic regions were probably visited by Norse walrus-hunters long before the historical period, but the first record of such visits dates back to the 9th century. The voyage of Other, or Octher, around the North Cape, has for ages been celebrated in song and story. In the 10th century, Eric the Red visited Southeastern Greenland, and founded a settlement there. In the 14th century two Italian navigators are supposed to have penetrated within the Arctic circle, and Columbus is supposed to have visited the seas of Iceland and Greenland 15 years before his discovery of America.

During the 16th century the Dutch, English, and other northern nations promoted discovery in the far north, with a view to a free and speedy passage to China and India. The discovery by

Columbus and succeeding navigators of the great western continent, and the success of Vasco de Gama in finding a way to India by the Cape of Good Hope, stimulated commerce and exploration. The claim of Spain and Portugal to the exclusive right of navigation and trade with the countries discovered by them, forced upon the northern nations the importance of discovering a northwestern passage to prevent a ruinous decline of their commerce, and maritime supremacy. Theoretically, nothing appeared more likely than that such a passage existed, and Magalhaen's discovery of the strait bearing his name was adduced by many as a reason why a corresponding passage should exist at the north. Cabot therefore made voyages in search of it, in 1495, 1497, and in 1502. Cortoreale did the same in 1500, and in 1501. Then followed Verazzano, Gomez, Rut, Cartier, and Frobisher,—so that, by the year 1578, the contour of Newfoundland, and of the North American coast, up to the Arctic circle, became tolerably well known.

In 1553, Sir Hugh Willoughby and Chancellor had also penetrated to the northeast, and had reached Nova Zembla; Willoughby and a portion of his followers losing their lives in the undertaking. Burroughs tried to the northeast in 1556, and added notably to the knowledge of those regions. Other English explorers followed him in the same direction. In 1594 a Dutch expedition, under Barentz, visited Nova Zembla and the Eastern Arctic, and the same leader sailed again in this direction in 1595 and 1597,—the leader in the last voyage losing his life on the return from Nova Zembla, where he had lost his vessel and had been obliged to winter. Some of his men reached home by way of Lapland, after untold suffering, and the hut in which they wintered was found, intact, by some voyagers in 1871.

The ill success of the attempts to the eastward finally drew the attention of the English to the possibility of crossing near the pole, the idea being suggested by the fact that fishermen and whalemen were able, generally, to penetrate the mysterious icy region farther in that direction than any other. Henry Hudson was sent by the Muscovy Company, in 1607, with instructions to follow this general line. He reached 81° N. lat., to the eastward of Spitzbergen, but was then obliged to return. In 1610 the same company sent out Poole—who only succeeded in reaching 77° N.—to the westward of Spitzbergen. Marmaduke about the same time is said to have penetrated north of Spitzbergen, to 82° N. lat. In 1614 and 1615, Fotherby made attempts in the same direction, which came to naught. From this time, with the exception of an abortive voyage of Capt. Wood, in 1676, the English appear to have abandoned all attempts to reach the north pole in that direction for 150 years.

Interest in the northwest passage was heightened by failure to advance toward the northeast. All the very early explorations had been undertaken under the belief that there was a short passage to the northwest, if it could only be found. Interest in the northwest had been revived in 1585, when some London merchants sent out John Davis, who followed the west coast of Greenland, discovered the strait which bears his name, as well as Cumberland Island, and, in a subsequent expedition, reached lat. 72° N. The Muscovy Company also sent expeditions in this direction in 1602 and 1606, which did not succeed in reaching as high a point as Davis had done.

Hudson, then in Dutch employ, searched for the northwest passage in 1608. He followed the American coast, and, in the course of his voyage, discovered the great river which bears his name. Two years afterward—this time in the English service—he discovered Hudson's Strait and Hudson's Bay. In the middle of this great sheet of water he found his fate, being, in consequence of a mutiny, set adrift to perish. The English continued to send expeditions to the north and northwest. Sir Thomas Button sailed in 1612, Gibbons in 1614, and Baffin in 1615. Important discoveries resulted. Baffin's Bay, the strait between Cumberland Island and the continent, and Horn, Lancaster, and Smith Sounds were all mapped; but, having found no passage, the English efforts in that direction now relaxed for some years.

Denmark, however, sent Jens Munk in 1619; and in 1631 the English renewed their attempts, which were continued in 1641 and 1646. These made known Southampton Island, Fox Channel, James Bay, Wager River, and Repulse Bay. The northern coast of Asia was explored by the Russians, who also discovered the Liakhov Islands and Wrangel's Land. By the middle of the 16th century Russian navigators, in small vessels, were traversing the Arctic, where it washed the shores of Siberia, and very numerous subsequent expeditions have been sent forth by that nation in that region, under Behring, Kotzebue, Liakhov, Wrangel, and other well-known names; their efforts continuing from 1610 to the present day. Our own territory of Alaska and the Aleutian Islands were discovered by Behring, who was engaged for many years in northern exploration, in which he eventually lost his life. Tchirikow was also a noted explorer, about 1740.

In 1773 an English expedition, in the "Carcass" and "Racehorse," was sent to Spitzbergen, in which Nelson participated, with the rating of coxswain.

Capt. Cook, in addition to his other achievements, has also connected his name indelibly with the northwest of America and Behring's Strait. England renewed the search for the northwest passage in 1818, under Sir John Ross, and continued it, under various celebrated men, until its discovery, in 1850, by Sir Robert McClure. All these different expeditions, as well as those sent in search of Sir John Franklin, resulted in the discovery and naming of a vast number of geographical points between 60° and 130° W., and up to 77° N., and in 1833 Sir James Ross discovered the North Magnetic Pole. The expeditions to the north and northwest, succeeding Sir John Franklin's last one, undertaken in 1845, became so numerous that it is only possible here to name a few who have distinguished themselves, such as Sir James Ross, Kellett, Collinson, McClure, Austin, Ommancy, Sherard, Osborne, Sir John Ross, Penny, Forsyth, Snow, McClintock, Inglefield, Belcher, Young, and other Englishmen; De Haven, Kane, Hayes, and Hall, Americans; while Koldewey, Lamont, Peyer, and Weyprecht followed the course to the north of Spitzbergen with great

success. To the north of our own continent some gallant land travelers have ventured, in a constant struggle with cold and privation extending, in some cases, over years.

Sir John Franklin himself, when a lieutenant, started from York Factory, in 1819, to proceed to the Arctic shore and explore eastward from the Coppermine River. He was accompanied by Doctor (afterwards Sir John) Richardson, Messrs. Hood and Back, midshipmen, and a seaman named Hepburn. They were occupied about 3 years, traveled 5500 miles, and failed to accomplish very much, suffering such extremities of cold and hunger that their preservation was a miracle.

Franklin made another land journey in 1825, descending the Mackenzie River. Parry, in 1827, attempted to reach the pole to the eastward by sledging over the ice. He reached 82° 45′, but found the ice setting to the southward almost as fast as he traveled to the north, and was obliged to return.

Back, who had accompanied Franklin, and Dr. King made an Arctic land journey in 1833. Dease and Simpson journeyed north about the same time, and discovered what is now called Victoria Land, and a sea clear of ice.

Dr. John Rae, in 1846–47, proved the connection of Boothia with the mainland of America, and completed our knowledge of the formation of the land to the eastward. These were all in addition to extensive sledge journeys taken with ships as a base. At this writing, Lieut. Schwatka, of the U. S. army, has just returned from a marvelous journey of 3251 miles in the extreme north, during which the party was exposed to a cold of —71° Fahrenheit for many hours. They were nearly a year in accomplishing their journey, and started with only one month's provisions, living off the game killed, as the natives did. His discoveries only confirm the sad fate of the whole of Sir John Franklin's command.

The northwest passage discovered by McClure is between Bank's and Prince Albert's Lands, through Prince of Wales Strait, Melville Sound, Barrow Strait, and Lancaster Strait to Baffin's Bay, and is of no practical utility on account of its permanent obstruction by ice. Since its discovery, Polar exploration has had for its object scientific discoveries chiefly.

In 1854 the exploration of Dr. Kane, U. S. Navy, through Smith Sound and Kennedy Channel, revived the belief in an open Polar sea,—the Polynia of the Russians, which had been advocated for two centuries,—but this has not been confirmed by subsequent explorers, although his route, by Smith Sound, is now generally believed to be the most practicable one to the pole.

Dr. Petermann, the geographer, maintained that past experience pointed to the belief that the best course to the pole was that between Greenland and Spitzbergen, or to the eastward of Spitzbergen, and his opinion influenced late attempts in this direction by the Swedes, Germans, and Austrians, and by Mr. Lamont, an Englishman. These attempts have been abortive, and progress seems hopeless in that direction. Franz Josef Land was discovered by the Austrians, extending to 82° N., and the officers of that expedition saw nothing to warrant the belief in an open Polar sea. In 1871 the Norwegian Capt. Karlsen sailed round Nova Zembla for the first time. In 1872, Capt. Hall, of the United States, by way of Smith Sound, Kennedy Channel, and Robeson Channel, reached 82° 16′ N. lat. All these late expeditions gave important contributions to scientific knowledge.

Capt. Nares, of the English navy, in 1875, reached by sledge journey the highest northern point, Commander Markham in command of the party. The latitude was 83° 20′ 26″, and there was so little evidence of open sea there that he called the ice "paleocrystic."

In the present year Nordenskjöld, already celebrated for exploration of the Kara Sea, succeeded in pushing his way along the whole of the northern coast of Siberia, and in coming out safely into the Pacific Ocean, a feat which was believed impossible up to that time.

Lieut.-Commander De Long, U. S. Navy, in command of the "Jeannette," passed into the Arctic by way of Behring's Strait, in 1879, and has not since been heard of. His expedition was composed of the best material, and it is altogether likely that he will, in due time, report himself, with great additions to our knowledge of the northern regions.

The explorers of the Antarctic region have been few, there having been no practical object to serve after the discovery of the routes to the Pacific and the Indian Ocean, by way of Cape Horn and the Cape of Good Hope.

The name Antarctic should, strictly speaking, be applied only to the ice-bound sea to the south of the Arctic Circle. It is generally, however, extended to include more or less of the cold regions round the south pole, without reference to the Circle. As compared with the Arctic, little is known of it. It is clear that the dangers to navigation, and the cold, greatly exceed those of the north, and that human beings, and most terrestrial animals, have more difficulty in subsisting within its limits. Capt. Cook, in his voyages, entered the Antarctic at three points, and was the first to throw doubt upon the "Terra Australis Incognita," formerly laid down on all charts. Cook attained 71° 10′ S. on the 107th meridian. Bellinghausen, in 1821, sailed several degrees within the Circle, and discovered Alexander's Land. Howell saw Trinity Land in the same year. Palmer, an American, saw Palmer's Land, to the westward of Trinity, in lat. 62°. Weddell, an Englishman, saw no new land, but reached lat. 74° 15′ S. In 1831–32, Biscoe was sent out by Enderby, of London, and discovered Enderby's Land. Dumont d'Urville and some others made some unimportant attempts to the southward in 1833–38. In 1840, Dumont d'Urville (French) and Wilkes (American), in command of exploring expeditions, discovered what is probably a group of islands, in 61° S. and 160° E., although both reported a continuous coast.

The most important expedition to the Antarctic was made by Sir James Ross, in the "Erebus" and "Terror," in 1839–43. He penetrated to 78° 11′ S., the highest ever attained. He discovered land in 70° 41′ S. and 172° 30′ E. He also named several volcanoes and other mountains, and ascertained the position of the south magnetic pole to be 75° 5′ S. lat. and 154° 8′ E. lon. It was an extraordinary voyage, and full of perils, while the scientific results were very great. In 1845, Capt. Moore was sent by

the British Admiralty to observe magnetic phenomena in a region of the Antarctic not visited by Ross. He reached the 73d parallel with difficulty.

The two Polar regions differ widely. The Arctic seas teem with animal life, and land animals are comparatively plenty. There are many birds, and vegetation, such as mosses, lichens, scurvy-grass, small shrubs and flowers, are found in their appointed season, and in varieties unknown in the Antarctic. In the latter region vegetation ceases at a comparatively early limit. Trees and shrubs cease to exist in the south at 56°. There is plenty of animal life in the sea, but no quadrupeds on the land. Birds, however, exist in great numbers, and in varieties unknown in the Arctic. The Antarctic climate is more severe than that of the Arctic. Researches show that a luxuriant tropical or semi-tropical vegetation formerly existed in the Polar regions. Beds of coal have been found in the Arctic and in Kerguelen Land. Remains of large trees have also been found underlying basalt. Fossil remains of trees and animals, which now exist only in the tropics, have been found at Disco, Smith Sound, and New Siberia.

It is impossible here to go into the theories which account for this.

The voyage of the "Eira," containing Mr. Leigh Smith's Arctic explorers, details of whose observations in the Spitzbergen seas were given in the daily papers in the month of November, 1880, has been instrumental in elucidating the polynial character of that part of the Polar basin into which the North Atlantic discharges its warm floods. The "Eira" left England on June 22, and a week's steaming brought her to Jan Mayen Island, whence with leisurely movement she advanced toward Spitzbergen, clearing its South Cape on July 30. Up to this time nothing remarkable occurred to the explorers, except that they found the ice to the west of Spitzbergen in such quantities as to preclude progress in that direction. But pursuing their way to the northward they reached Franz Josef Land, discovered a new and well-sheltered harbor, and on their final trip, August 24, attained in their yacht the high latitude of 80° 20′ N. in longitude about 40° E. Since 1865, when Petermann's researches seemed to establish the extension of the Gulf Stream's thermal influence up to Spitzbergen, the Arctic waters in its vicinity have been invested with a peculiar interest, as possibly offering an advantageous approach toward the Pole. The polynias seen by so many polar voyagers between Spitzbergen and Nova Zembla and the readiness with which high latitude has been frequently made in this direction, apparently confirm the supposed Gulf Stream or Atlantic influence between these Arctic islands. "Our observations," says Payer, "proved the existence, in the Eastern Nova Zembla seas, of a band of warm water from 36 to 40 feet deep," and Middendorf and Mack found evidences of a warm water agency as far east as 60° and 81° E. lon. North of Spitzbergen, however, Parry found in 1827, as others more recently have, that the Polar stream is pressing its way southward. These facts point to the extension of the Atlantic drift movement far to the east of Nova Zembla, and even north of the New Siberian Islands, with the consequent formation of occasional polynias. Mr. Leigh Smith's late voyage did not extend so far east, but so far as it did extend it is confirmatory of Petermann's general conclusions as to the comparative openness of these waters.

The effect of a warm current on the pack-ice of high altitudes by no means insures a free passage for a ship, and it may, as Petermann believed, only make "a blind alley of ice." But where such a thermal agency is present Arctic travelers will be encouraged to conclude with Lieut. Payer, that "the hope of finding a navigable sea in latitudes not hitherto attained is not yet extinct." As it is possible the "Jeannette," should she have prosecuted her voyage to the northwest of Wrangel Land, may ultimately enter the seas contiguous to Franz Josef Land and Spitzbergen, she may supplement Mr. Leigh Smith's exploration.

Polar Forces. Forces that act in pairs with opposite tendencies or properties, as in magnetism, electricity, etc.

Polaris, or Pole-star. The name of the star *α Ursæ Minoris*, so called from its being the bright star which is nearest to the north pole of the heavens. Its Arabic name is *Ruccabah*, and it is also known as the *Cynosure* (from *kuōn*, *kunos*, a dog, and *oura*, the tail,—the constellation of Ursa Minor being anciently figured as a dog). Polaris can readily be found by the "Pointers" β and α Ursæ Majoris, being the first bright star which the line of their direction passes. α Ursæ Majoris (Dubhe) is at the same distance from the stars in the extremities of the two constellations the Great Bear and the Little Bear, the former being η Ursæ Majoris, and the latter α Ursæ Minoris, or Polaris. The star α Ursæ Minoris has not always been, and will not always continue to be, the pole-star. The precession of the equinoxes may be viewed as a very slow motion of the pole of the heavens among the stars in a small circle round the pole of the ecliptic. The effect of this is an apparent approach of some stars to the pole and recess of others. When the earliest catalogues were constructed, the present pole-star was 12° from the pole; it is now less than 1½°, and will approach to within ½°, when it will begin to recede and give place to others. Four thousand years ago *α Draconis* was the pole-star, and was but 10′ from the pole; after the lapse of 12,000 years, *α Lyræ*, the brightest star in the northern hemisphere, will be the pole-star, approaching to within about 5° of the pole. The present pole-star is calculated to be about 292 millions of millions of miles from the earth.

Poldavis, or Poldavy. A canvas from Dantzic, formerly much used. A kind of sail-cloth thus named was also formerly manufactured in Lancashire.

Pole-ax. A sort of hatchet, resembling a battle-ax, which was used on board ship to cut away the rigging of an adversary; and also, in boarding an enemy whose hull was more lofty than that of the boarders, by driving the points of several into her side, one above another, and thus forming a kind of scaling-ladder; hence were called boarding-axes.

Poles (Gr. *polos*, a pivot on which anything turns; the axis of the sphere). The points at the extremities of the axis of the celestial sphere, which in the diurnal revolution appear station-

ary, and about which the whole of the heavens appear to turn as upon pivots. This is the primary use of the term. Hence it is extended and applied to extremities of the axis of the earth; hence, also, its more purely geometric uses. The term is still further extended to physics; thus, when it was found that the magnet did not always point to the north pole, but to another point, this point was naturally named the magnetic pole. Also, the upper ends of the upper masts when they rise above the eyes of the rigging.

Pole-star. See POLARIS.

Policy. The written instrument that evidences the contract of insurance. (See MARINE INSURANCE.) In another sense it signifies a course of governmental administration or of individual action.

Poll. A fish, called also *chub* or *chevin*.

Pollack. The *Merlangus pollachius*, a well-known member of the cod family.

Pollard. The chub-fish.

Pollux. The star β *Geminorum*. See GEMINI.

Polyneme. A sea-fish of the genus *Polynemus*, characterized by having the ventral fins abdominal instead of thoracic.

Pomfret. A delicate sea-fish taken in great quantities in Bombay and Madras.

Pommelion. An old name for the knob on the breech of a cannon.

Ponches. Small bulk-heads made in the hold to stow corn, goods, etc.

Poncho. A blanket with a hole in the centre, large enough for the head to pass through, worn by natives of South and Western America.

Pond. A cant term for the ocean. *French pond*, the Mediterranean.

Pontones. Ancient square-built ferry-boats for passing rivers, as described by Cæsar and Aulus Gellius.

Pood. A Russian commercial weight, equal to 36 pounds.

Poop. A partial deck elevated above the spar-deck, and extending from the mizzen-mast aft. A vessel is *pooped* when, in running before a heavy sea, the waves break over the taffrail.

POOP-ROYAL. A short deck or platform formerly placed over the aftmost part of the poop in the largest of the French and Spanish men-of-war.

Poor, Charles H., Rear-Admiral U.S.N. Charles H. Poor was born at Cambridge, Mass., in June, 1809. Appointed midshipman from Massachusetts, March 1, 1823; attached to sloop-of-war "John Adams," West India Squadron, 1827; frigate "Java," Mediterranean Squadron, 1829.

Promoted to passed midshipman, March 29, 1829, and ordered to frigate "Delaware," Mediterranean Squadron, 1830; sloop-of-war "Lexington," Brazil Squadron, 1833, and brig "Boxer," same squadron, 1834.

Commissioned as lieutenant, December 31, 1833; rendezvous, Norfolk, Va., 1836; razee "Independence," Brazil Squadron, 1840; navy-yard, Washington, 1846–48; inspector, etc., 1850–51; frigate "St. Lawrence," Pacific Squadron, 1852–55.

Commissioned as commander, September 14, 1855; navy-yard, Norfolk, Va., 1856–58; commanding sloop-of-war "St. Louis," Home Squadron, 1860–61; commanded expedition of sailors and marines to reinforce Fort Pickens, 1861; frigate "Roanoke," North Atlantic Blockading Squadron, 1861–62. Commander Poor took command of steamer "Illinois," to act as a ram against the "Merrimac," but did not have an opportunity to test the power of his vessel. Passed rebel batteries, under fire, at Sewell's Point, while proceeding from Hampton Roads towards Newport News in frigate "Roanoke," to assist the "Congress" and "Cumberland."

Commissioned as commodore, January 2, 1863; commanding sloop-of-war "Saranac," Pacific Squadron, 1863–65; compelled the authorities at Aspinwall to release U. S. mail-steamer detained to collect illegal dues (approved by Secretary of the Navy); compelled authorities at Rio Hacha to hoist and salute the American flag, which had been insulted (approved by Secretary of the Navy); commanding Naval Station at Mound City, Ill., 1866–68.

Commissioned as rear-admiral, September 20, 1868; commandant navy-yard, Washington, 1869; commanding North Atlantic Squadron, 1869–70; member Retiring Board, 1871–72. Retired June 9, 1870.

Poor John. Hake-fish salted and dried, as well as dried stock-fish, and bad *baccalao*, or cod, equally cheap and coarse.

Popler. An old name for a sea-gull.

Poppets. The upright pieces which are fitted between the ship's bottom and the bilge-ways at the extreme ends of the ship, to support her in launching. Small pins on the gunwale of a boat to form a rowlock.

POPPET-RIBBANDS. Pieces of oak plank running across the poppets, fore-and-aft, to which they are secured.

POPPET-LASHING. Chain-cables passed around the poppets and over the poppet-ribbands, from side to side, to support the extremities of the vessel in launching.

Poppet-valve. A steam-valve made in the form of a frustrum of a cone, which acts by opening and closing a conical port; it receives its motion from a rock-shaft by means of a lifting-toe, working under a similar toe on the valve-stem; there are two kinds, the single- and double-poppet valve; the latter is a balanced valve.

Poppling. Sea-waves in irregular agitation.

Porbeagle. A kind of shark.

Porcupine-fish. A fish of the tropical seas, which is covered with spines or prickles capable of being erected by its inflating the body. It is the *Diodon hystrix* of Bloch.

Pores. Minute, dark spots on the sun.

Porgy. A salt-water fish of the gilt-head kind, much esteemed for food. The common species in North America is the *Pagrus argyrops*. The *sand-porgee* is the *Sargus arenosus*.

Porpoise (*Phocæna*). A genus of cetacea of the family *Delphinidæ*, having a form similar to the dolphins, but the muzzle short, uniformly convex, and without a beak; a dorsal fin; the teeth very numerous, simple, and equal. The grampus (which see) is generally referred to this genus.

Port. An opening from the steam-chest to the cylinder of a steam-engine; if for the admission of steam, it is termed the *induction*, or *steam-port;* if for the exhaust, it is termed the *eduction*, or *exhaust-port*.

An opening in the side of a ship-of-war through

which a gun is fired. *Cargo-ports* and *lumber-ports* are fitted in merchant ships for the purpose of receiving and discharging cargo and lumber.

A place of resort for vessels for commercial purposes. (See HARBOR.) A place more or less protected from the wind and sea, and used as a place of refuge for vessels in tempestuous weather. The left side of a vessel,—a term which has been substituted for the old word *larboard*, as being less likely to be mistaken for *starboard*.

PORT-BARS. Strong pieces of oak by which the ports are secured from flying open in a gale of wind, the bars resting against the inside of the ship; the port is first tightly closed by its hooks and ring-bolts.

PORT-CHARGES, or HARBOR-DUES. Charges levied on vessels resorting to a port.

PORT-FLANGE. A wooden batten coved out and fitted on the ship's side, over the ports, to prevent the water from running into the port. A *port-riggle*.

PORT-PENDANTS. Ropes spliced into rings on the outside of the port-lids, and rove through leaden pipes in the ship's sides, to work the port-lids up or down by the tackles.

PORT-PIECE. An ancient piece of ordnance.

PORT-SASHES. Half-ports fitted with glass for the admission of light into cabins.

PORT-SILLS. Pieces of oak dovetailed into the frame-timbers to form the upper and lower part of the ports.

PORT-STOPPER. A heavy piece of iron, made to swing round and close the port in a turret-vessel.

Port au Prince, the principal seaport and capital city of Hayti, is situated at the head of Gonaïves Bay, in lat. 18° 35′ N., lon. 72° 18′ W. It is partially fortified. The vicinity is marshy, and the climate unhealthy. It is the seat of the greater part of the foreign trade of the island, the annual value of the imports being about $1,200,000. Pop. 20,000.

Porter, B. H., Lieutenant U.S.N. See PRESTON.

Porter, David, Commodore U.S.N. Born in Boston, February 1, 1780; died in Pera, Turkey, March 28, 1843. At the age of 16 he made a cruise to the West Indies in a merchant vessel, and during the two succeeding years made several voyages in merchant ships. He was twice impressed by British vessels of war, and on each occasion took the first opportunity to escape and work his passage home. In April, 1798, he obtained a midshipman's appointment in the navy. Midshipman Porter served in the frigate "Constellation" in her action with the French frigate "Insurgente," February 9, 1799. In October, 1799, he was promoted to the grade of lieutenant, and ordered to the West India Station as first lieutenant of the schooner "Experiment." On the 1st of June, 1800, this vessel, with several sail of merchantmen under convoy, lay becalmed in the bight of Leogane, in the island of San Domingo. While thus lying, they were attacked by 10 piccaroon barges, each containing 40 men, with swivels mounted in the bows and on the quarters. The "Experiment" had been disguised to look as much like a merchant ship as possible, and the piccaroons steered for her with the evident intention of boarding. At this critical moment her commanding officer showed the white feather, and was about to surrender to a force he considered it hopeless to contend against, when Lieut. Porter, backed by Lieut. Blake, protested so vigorously that it was determined to defend the ship and convoy to the last; and after a combat which continued for 7 hours, the pirates having lost 2 of their barges sunk by the schooner's fire, and many of their men killed and wounded, withdrew from the fight. Shortly after the affair of Leogane, Lieut. Charles Stewart (Old Ironsides), was ordered to command the "Experiment," and for some months these two officers, Stewart and Porter, who afterwards became so famous, served together in the little schooner, and while thus serving captured the French schooner-of-war "Diane." In October, 1803, Lieut. Porter was captured in the frigate "Philadelphia," and remained a prisoner in Tripoli until peace was proclaimed.

In 1806 he was promoted to master-commandant, and on the 10th of March, 1808, Commander Porter was married to Miss Anderson, of Chester, Pa. In 1812 he was promoted to the grade of captain. Between the years 1809 and 1812, Capt. Porter was a large portion of the time on special duty in New Orleans, and while there he made the acquaintance of the Farragut family, and took under his special protection young David Farragut, who became in after-years the most renowned of our admirals. At the beginning of hostilities in 1812, Capt. Porter sailed from New York in command of the "Essex," 32, and in a short cruise captured several British merchantmen and transports. Soon afterward he fell in with and captured the British corvette "Alert," 20. On December 11, near the equator, he captured the British government packet "Norton," with $50,000 in specie on board. In January, 1813, Capt. Porter proceeded to the Pacific with the intention of doing all the damage he could to the English whale-fishery in that ocean.

On March 25, he captured the Peruvian privateer "Nereyeda" of 19 guns, which had taken two American whalers and had their crews on board as prisoners. They were transferred to the "Essex," and the armament and ammunition of the "Nereyeda" thrown overboard, when she was released. After this, Capt. Porter cruised about 10 months in the Pacific, capturing 12 British ships employed chiefly in the sperm-whale fishery, and for a time that important British interest in the Pacific was almost destroyed. The "Georgiana," captured whaler, was converted into a vessel of war called the "Essex, Jr.," and cruised with the "Essex." On February 3, 1814, the "Essex" and "Essex, Jr." arrived at Valparaiso. On the 8th, H. B. M. frigate "Phœbe" and sloop "Cherub" arrived and anchored near the "Essex," and after obtaining supplies cruised off Valparaiso 6 weeks. On March 28 the "Essex" made an attempt to get to sea, but in doubling a headland was struck by a squall, which carried away her fore-topmast and caused the loss of several of her crew. In this crippled state the ship anchored less than 3 miles from the town, only half a mile from the shore, and while within neutral waters was attacked by the "Phœbe" and "Cherub," the first shot being fired at 3.54 P.M. The "Phœbe's" fire proved very destructive, as she occupied a position where her

long guns could rake the "Essex," while that vessel could hardly bring a gun to bear against her, the "Cherub" meanwhile pouring in a galling fire. The latter vessel, however, soon found her position such a hot one that she was driven to leeward, near the "Phœbe," where both vessels kept up a raking fire on the American frigate. Capt. Porter now got three long 12-pounders out of the stern port, and these guns were so well worked that in half an hour both the attacking vessels hauled off to repair damages. The enemy's vessels having finished repairs, took up their position on the starboard quarter of the "Essex," out of reach of her carronades, and where her long guns could not be brought to bear upon them. Their fire was very severe, and Capt. Porter had no alternative but to get under way and become the assailant. The flying-jib was set and the cable cut, and the "Essex" ran down upon her assailants, and for a short time succeeded in closing with them, so as to use her carronades with such effect that the "Cherub" was forced to haul off, and for a few minutes the hope was entertained that the enemy were so far disabled as to permit the "Essex" to escape; but the hope proved a vain one, as the "Cherub" kept up a destructive fire with her long guns, and the "Phœbe" chose the distance best suited to her long 18's, where, out of the range of the carronades of the "Essex," she kept up a deliberate and destructive fire. The action had now lasted over two hours, and the "Essex" lay like a target, riddled by every shot from the enemy. The crew were completely exhausted, and had become so weakened in numbers that they entreated the captain to surrender in order to save the lives of the wounded, and accordingly, at 20 minutes past 6, the order was given to haul down the colors. The contest throughout was a most unequal one, the enemy having the advantage in every way. In this action young Farragut, who was serving on board as a midshipman, fought most bravely, and was especially commended by Capt. Porter in his official report.

The "Essex, Jr." brought the survivors of the action to the United States, where Capt. Porter was received with great honors. His narrative of this cruise was published in New York in 1822. His son, Admiral Porter, describes it most vividly in his life of Commodore Porter, published in Albany in 1866. From April, 1815, to December, 1823, Capt. Porter was a member of the Board of Navy Commissioners, which post he resigned to take command of the expedition fitting out against pirates in the West Indies. In October, 1824, upon evidence that a quantity of valuable goods had been stored by pirates at Foxardo, in the east end of Porto Rico, Commodore Porter dispatched the schooner "Beagle" to investigate the matter, but the officers on landing were arrested and thrown into prison. Commodore Porter on hearing of this outrage sailed for the island, landed a force of 200 men, and demanded an apology, which was promptly given. The authorities at Washington deeming he had exceeded his powers brought him before a court-martial, and he was sentenced to 6 months' suspension. He soon after resigned, and entered the service of Mexico as commander-in-chief of the naval forces, at a salary of $25,000 per annum. He remained in this service until 1829, when having been treated most treacherously by the Mexican officials, and betrayed by those he had the most reason to expect good faith from,—the very officers he had taught the rudiments of their profession turning against him because he was a foreigner,—Commodore Porter resigned his position, returned to the United States, and was appointed by President Jackson consul-general to the Barbary powers, from which post he was transferred to Constantinople as resident minister there, which office he held when he died. His remains are interred in Woodland Cemetery, West Philadelphia.

Porter, David Dixon, Admiral U.S.N. Born June 8, 1813, in Chester, Pa. In 1824 he accompanied his father, Commodore David Porter, in the "John Adams," and was with him during that memorable expedition which forever suppressed piracy in the West Indies. The resignation of Commodore Porter from the U. S. navy on account of the failure of our government to sustain him in his energetic measures, resulted in his becoming admiral of the Mexican navy (1826), that people being then engaged in their struggle for independence.

David D. Porter was appointed a midshipman in the Mexican service. He obtained service afloat with his cousin, Capt. D. H. Porter, who commanded a Mexican vessel cruising against Spanish commerce. After a most adventurous and successful cruise, Capt. Porter was obliged to return to the rendezvous at Key West on account of a mutiny on board. Its early discovery was due to the precocity of Midshipman Porter, who had then arrived at the age of 14 years. In the struggle with the mutineers Midshipman Porter handed the pistols and sword to Capt. Porter, who by his coolness and determination soon disabled the ringleaders and brought all to terms. Of the whole crew, only three remained faithful.

In order to secure the prisoners and prevent them from meddling with their irons, Capt. Porter cut holes in the poop-deck so as to allow the feet of the prisoners to go through into the cabin, where they were ironed together. The captain, assisted by Midshipman Porter and three men, succeeded in running the Spanish blockade and bringing the vessel and captured property into Key West. During the spring of 1828, the brig "Guerrero," 22 guns, Capt. D. H. Porter, was fitted out to cruise against Spanish commerce. Midshipman Porter was again detailed to duty under Capt. Porter. The "Guerrero" had a fine crew of 186 men. Soon after arriving on the coast of Cuba, Capt. Porter attacked two Spanish brigs of superior force convoying a merchant fleet. The firing brought a Spanish 64-gun frigate to the rescue of the convoy, thus robbing Capt. Porter of the fruits of a victory fully secured, and forcing him to fight a vessel infinitely the superior of the "Guerrero." After a desperate resistance the brig was forced to surrender. In this action Capt. Porter and nearly half his crew were killed, and all the officers were more or less severely wounded. The survivors were imprisoned in the guard-ship at Havana. Midshipman Porter, after a short imprisonment, was allowed to go to Vera Cruz, and soon after (1828) he returned to the United States. It is a singular fact that the nation is indebted to Commodore David Porter not only

for his own brilliant career, but also for the two most distinguished naval officers of recent years, as both Farragut and the subject of this sketch were brought up under the personal care of that officer, and under his command fought their first battles.

David D. Porter was appointed midshipman in the U. S. navy February 2, 1829. He served on the European Station until 1835.

Many amusing stories are told of his career as a midshipman, although the commodore of the squadron and the captain of his ship may not have fully appreciated them.

In 1836 he was promoted to passed midshipman. He served on the coast survey until he was promoted to lieutenant, February, 1841. Served at sea and at the Naval Observatory until 1846, when he was selected by the Secretary of State to go on a secret mission to Hayti to report upon the condition of affairs in that island. This he did in a very thorough manner.

He served with distinction during the entire Mexican war as first lieutenant, and afterwards as commanding officer of the steamer "Spitfire." He was engaged in every action on the coast. After that war he obtained a furlough from the Navy Department, and for some years commanded steamers on important passenger lines. His vessels never met with an accident.

The Secretary of War during Mr. Buchanan's administration selected him for the duty of importing camels into this country; 84 were brought over in the U. S. ship "Supply." The breaking out of the war found Porter a lieutenant on shore duty. In a little over two years he was a rear-admiral, commanding a squadron. As a lieutenant commanding the "Powhatan," under confidential orders from President Lincoln, he assisted in the relief of Fort Pickens. Soon after he was made a commander. The Department was undecided in regard to the officer who should command the expedition against New Orleans. Some foolish doubts had been expressed as to Farragut's loyalty. From the "Life and Letters" of Admiral Farragut recently published, we learn that "Commander David D. Porter, who had been taken into the confidence of the Secretary, was sent as an intermediary to ascertain whether the proposed service would be agreeable. The result was that Farragut was ordered to report in person at the seat of government," and soon after received his preparatory orders to command the Western Gulf Blockading Squadron. From the same authority it appears that the Secretary informed Flag-Officer Farragut that "there will be attached to your squadron a fleet of bomb-vessels and armed steamers enough to manage them; all under command of Commander D. D. Porter, who will be directed to report to you." This was the first of the famous mortar fleet which did such good service.

The mortar fleet, consisting of 21 mortar-schooners, each carrying a 13-inch mortar, and 5 steamers as convoys, reached the mouth of the Mississippi during March, 1862. Soon after, 4 of the vessels of Farragut's fleet arrived, and preparations were made for the attack on Forts Jackson and St. Philip. The vessels of the mortar fleet were towed to proper range near the forts on the 18th of April, and for six days and six nights fired continuously on the rebel works, the officers and men being divided into three watches. Six thousand bombs were exploded in the forts, and the fire from them had destroyed everything combustible in the works; their garrisons had become so demoralized that in the judgment of the flag-officer the passage of the fleet was practicable, and it was successfully accomplished during the night and early morning of April 24.

Flag-Officer Farragut having destroyed the enemy's fleet of 15 vessels, proceeded to New Orleans, which place he reached next day. The reduction of the forts was left to Commander Porter. They surrendered to him on the 28th of April, after one day's bombardment. Commander Porter zealously assisted Flag-Officer Farragut in all his operations between New Orleans and Vicksburg, and at the latter place bombarded the forts very effectively, enabling the fleet to pass safely. Admiral Farragut, in his official report of June 30, 1862, says, "The Mortar Flotilla have never done better service than at Vicksburg, notwithstanding the imperfection of their fuzes. I have no doubt that they did the forts on the heights great damage, and on the morning of the attack did much to distract the fire from the fleet." In July, Porter was ordered with most of his mortar fleet to Fortress Monroe, but as there was no chance for immediate service at that point, he gave up the command of the Mortar Flotilla, which he had made famous, and was soon after ordered to the command of the Mississippi Squadron, as acting rear-admiral, September, 1862. He improvised a navy-yard at Mound City, and the small squadron of only a dozen effective vessels was soon increased to over 120, fully manned and officered by 1300 officers, only 25 being regular naval officers. The vessels were river-boats converted into efficient war-vessels, by covering them with light armor and putting heavy guns on them. The officers were chiefly Western steamboat-men, who, under Porter's rigid discipline, soon became valuable and trustworthy officers. In January, 1863, Admiral Porter's fleet, in co-operation with Sherman's army, captured Arkansas Post, a very formidable fort on the Arkansas River, 50 miles from its mouth, for which Porter received a vote of thanks. Soon after he ran past the batteries at Vicksburg and succeeded in capturing the rebel forts at Grand Gulf. This put him in close communication with Gen. Grant, who, on the 18th of May, by means of the fleet, put himself in the rear of Vicksburg, and from that time the energies of the army and navy were devoted to the capture of that stronghold, which was finally accomplished July 4, 1863. Porter received the thanks of Congress and was commissioned a rear-admiral from that day.

During the remainder of 1863 the squadron of Rear-Admiral Porter was busy keeping the Mississippi River open, and the next spring he went up the Red River to co-operate with Gen. Banks, but the military part of the expedition failed, and the retreat of the army left the gunboats in a bad way, being above the rapids after the fall of the river. However, the energy of Rear-Admiral Porter, and the skill of Lieut.-Col. Bailey, an old river engineer, saved the fleet by building a dam below the rapids, thus sufficiently deepening the water so as to enable the gunboats to pass down safely.

Admiral Porter now possessed the entire confidence of the Department and of the nation, and was ordered to the command of the North Atlantic Blockading Squadron, which embraced within its limits Cape Fear River and the port of Wilmington.

A fleet comprising all the available vessels at the disposal of the Department was assembled at Hampton Roads. In December it sailed for Beaufort, N. C. On December 24, 1864, Rear-Admiral Porter, with a force of 35 vessels, 5 of which were ironclads, and a reserve force of 19 vessels, commenced the bombardment of the forts at the mouth of Cape Fear River, and silenced them in an hour and a quarter.

General Butler, who commanded the military forces, after a reconnoissance, decided that Fort Fisher could not be carried by assault. He therefore returned with his command to Hampton Roads. Admiral Porter, aware of the necessity of reducing the works and the great importance of closing the port of Wilmington, and confident that with adequate military support the fort could be carried, earnestly requested that the enterprise should not be abandoned. A second military force was promptly detailed, composed of about 8500 men, under command of Major-Gen. A. H. Terry. This force arrived off Fort Fisher on the 13th of January. Offensive operations were at once resumed by the naval force, while the troops landed and intrenched themselves. The bombardment was continued throughout the 14th with an increased number of vessels. The 15th was the day decided upon for the assault. During the morning of that day 44 vessels poured an incessant fire into the fort. There was besides a force of 14 vessels in reserve. At 3 P.M. the signal for the assault was made. Desperate fighting ensued, traverse after traverse was taken, and by 10 P.M. Fort Fisher was captured.

Fourteen hundred sailors and 500 marines were landed and participated in the direct assault. Seventy-five guns, many of them superb rifle pieces, and 1900 prisoners were the immediate fruits of the victory.

Rear-Admiral Porter received the thanks of Congress for the Fort Fisher affair, being the fourth vote of thanks received by him during the war, including the general one for the capture of New Orleans.

He was promoted to vice-admiral in July, 1866, and was ordered as superintendent of the Naval Academy. His energy and ability first brought that institution into prominence, and so changed its character that it has ever since been considered the best naval college in the world.

Upon the election of Gen. Grant to the Presidency, Vice-Admiral Porter was detailed for duty in the Navy Department under Secretary Borie. But upon the withdrawal of Mr. Borie from the Cabinet, he, in a short time, also withdrew from the Department. In August, 1870, he was promoted to admiral of the navy, and since that time has devoted himself to his duties as senior officer of the navy.—*R. M. G. Brown, Lieutenant U.S.N.*

Port-fire. A stick of highly inflammable composition, consisting of nitre, sulphur, and mealed powder. It is now used principally for life-buoy lights on account of its ability to resist the action of water. In early days it was used in firing guns. It forms good material for incendiary shell.

Portland, the commercial metropolis of Maine, is situated in Cumberland County (of which it is the county-seat), on Casco Bay, in lat. 43° 39′ 27″ N., and lon. 70° 15′ 40″ W. The peninsula on the west shore of Casco Bay, on which the city is located, is about 3 miles in length, by an average breadth of three-quarters of a mile. The harbor is one of the best on the Atlantic coast, is well protected, of sufficient depth to float the largest ships, and is open all the year. It is defended by Forts Preble, Scammel, and Gorges. The city has an extensive coastwise and foreign trade, the annual value of the exports being about $22,000,000, and the imports $20,000,000. There are 2 dry-docks and other facilities for repairing ships, and ship-building was for a long time a leading pursuit. Railroad-cars, locomotives, marine and other engines are important articles of manufacture. Pop. 37,000.

Port Royal. See NAVAL STATION.

Portsmouth, a seaport town and the principal naval station of England, is situated on Portsea Island, at the entrance to its famous harbor, in lat. 50° 48′ N., and lon. 1° 16′ W. This town, inclosed as it is by bastioned ramparts, faced with masonry, surrounded by trenches and outworks, is the most perfect fortress in Great Britain. The town of Portsea is separated from Portsmouth by a creek, and is also inclosed by a line of fortifications. Within this town is the naval dock-yard, containing basins, wet- and dry-docks, large warehouses, anchor-forges, iron- and copper-mills, rope-houses, etc. In the dock-yard are also the royal naval college, and the residence of the port-admiral. Between the dock-yard and Portsmouth is the gun-wharf or arsenal, containing an armory, and artillery and ammunition depots. The harbor is large enough to hold the entire navy of Great Britain, although at its entrance it is only 220 yards wide. Pop. 115,000. See ESTABLISHMENTS, NAVAL, OF GREAT BRITAIN.

Portsmouth, the commercial metropolis and only seaport of the State of New Hampshire, is situated on a beautiful peninsula, formed by the Piscataqua River, and on the right bank of that river, about 3 miles from the ocean. The harbor, which lies between the town and the mouth of the river, is capacious, deep, easy of access, and is much frequented by vessels in bad weather. Sand-bars or ice cannot form owing to the rapid tides. The main entrance to the harbor, between the mainland and Great Island, is defended by earth-works on Gerrish's Island and Jeffrey's Point, and farther up the harbor are two stone forts (Constitution and McClary). A U. S. navy-yard is located here, for a full description of which see NAVY-YARD, PORTSMOUTH, N. H. The leading articles of manufacture are cotton, cloth, hosiery, shoes, etc. Pop. 10,000.

Portsmouth, Norfolk Co., Va., is on the left bank of the Elizabeth River, nearly opposite Norfolk. The river, which is about two-thirds of a mile wide, forms a good harbor, which admits vessels of the largest size. Large steamboats ply daily between Baltimore and Portsmouth. A naval hospital is located here, and in the adjacent suburb of Gosport the navy-yard commonly known as the Norfolk Navy-

Yard is situated. (See NAVY-YARD (GOSPORT), NORFOLK, VA.) Pop. 11,000.

Portugal, Navy of. Not until Columbus had settled the question of the rotundity of the earth could the Portuguese mariners be induced to sail as far as the equinoctial line. In the few trips made in a southerly direction they had encountered water-spouts, beheld a comet, and experienced a degree of heat which alarmed them exceedingly,—the more ignorant and superstitious believing they were approaching the region of eternal flames. But the return of the vessels which had carried the Genoese explorer to San Salvador reassured the sailors of Lusitania, and raised the hopes of the people that a path might be found to India in an easterly direction. Then it was that John II. caused ships to be constructed for the purpose of contending with the winds and the waves of the tropics, and Bartolomew Diaz was selected to make the first attempt. The passage along the west coast of Africa was tolerably smooth, but off the southernmost point the opposition of the winds was so great that no other name could be found for the locality than *Tormentoso*. The point, however, was settled that Diaz had been sent to determine. He had rounded the cape at the southern extremity of the African continent, and thus demonstrated that there was a clear passage to India. The *Capo de buon Esperanza* was the name given to the cape, and Diaz went back to carry tidings of "golden times and happy news of price." Not an hour was lost in taking advantage of the discovery. Vasco da Gama was appointed to proceed to India with three ships of 200, 120, and 100 tons burden, and authority to open a traffic with the people who had theretofore sent their produce and manufactures to Europe only by the Red Sea and Persian Gulf, or to war with them if they manifested hostile inclinations. Da Gama's voyage to the west coast of India was a success in every way; but it aroused the jealousy of Holland and England, and justified the creation of a small navy in the event of collision with those powers. There is little to chronicle of the operations of the Portuguese navy at any time, and its strength at the present day consists of 1 armored ship, 10 screw-corvettes, 9 gunboats, 1 sailing-frigate, 1 sailing-corvette, 3 transports, 2 tugs, and 1 yacht. The ironclad "Vasco da Gama," built at the Thames Iron Ship-building Yard, London, and launched in 1876, is the most important vessel of this navy; the length of the vessel between perpendiculars is 200 feet; breadth, 40 feet; depth of hold, 25 feet; draft of water forward, 17 feet 6 inches; aft, 19 feet; displacement, 2479 tons; thickness of iron on the armored belt and battery, 9 inches; thickness of teak backing, 10 inches. The motive machinery consists of a pair of vertical compound engines for each of the two screw-propellers. At their trial they developed 3625 horse-power, and the ship realized a speed of 13¼ knots per hour. The ship is fitted with a ram, and her armament consists of Krupp breech-loading rifles, —two of 10¼ inches calibre and 21 tons weight, one 6 inches calibre and 4½ tons weight, and two 40-pounders. The "Estephania" is the largest of the corvettes, but is an old vessel. The only modern corvettes are the "Rainha da Portugal" and the "Mindello," sister ships, 170 feet long, 36 feet beam, having single screw-propellers, operated by compound engines of 900 indicated horse-power, and the armament of each consists of two 4½-ton and six 40-pounder Armstrong guns. Two of the gunboats,—the "Mandovè" and "Bengo,"—built in 1879, are each 123 feet long, 24 feet beam, and 334 tons displacement, and are armed each with one Armstrong pivot-gun and two 20-pounders. The other corvettes and gunboats are of old date. The naval arsenal is located at Lisbon, and comprises the ship-yard, the depots of arms and provisions, the museum, and the naval school. The *personnel* is comprised as follows: 1 vice-admiral, 5 rear-admirals, 17 captains of line-of-battle ships, 26 captains of frigates, 32 lieutenant-captains, 57 first-class lieutenants, 78 second-class lieutenants, 7 engineers of marine construction, 57 mechanicians, 22 surgeons, 38 paymasters, and an active force of 3950 enlisted men, including marines.

Portuguese Man-of-war. A beautiful floating acalephan of the tropical seas; the *Physalis pelagica*. See PHYSALIA.

Position. The position of a ship at sea is determined generally by the intersection of two right lines. These lines may represent *latitude* and *longitude*, two *lines of equal altitude*, etc. When in sight of land the position is determined by *cross-bearings*, by *one* bearing and a *line of equal altitude*, by any line and the depth of water, etc.

Post-captain. See CAPTAIN.

Pouches. Wooden bulk-heads across the hold of cargo-vessels, to prevent grain or light shingle from shifting.

Pound. A lagoon, or space of water, surrounded by reefs and shoals, wherein fish are kept, as at Bermuda.

Pound-and-pint Idler (*Eng.*). A sobriquet applied to the purser.

Pout. A sea-fish of the cod kind, about a foot in length; called also the *whiting*. It has the power of inflating a membrane which covers the eyes and neighboring parts of the head. An American fish of the genus *Pimelodus* (*P. cattus*); catfish; horned pout; bullhead.

Powder for the naval service is classed according to the size and shape of the grain, and designated as follows: hexagonal, cubical, mammoth, rifle, cannon, torpedo, small-arm, and shell powder. They are all, as a rule, made of the same proportion of ingredients,—*i.e.*, saltpetre 75, charcoal 15, and sulphur 10 parts. Hexagonal and cubical powder must weigh 70 to 75 granules to the pound; the other classes are sized by means of sieves, the holes in which vary in diameter from 1 to .02 of an inch. When powder is stored on shore, it is put up in barrels marked with maker's name, date and place of manufacture, initial velocity, density, pressure, kind, lot, and class. When stowed on board ship, it is put up in tanks, marked the same as the barrels from which the powder was taken. See GUNPOWDER.

POWDER-HOY. An ordnance-vessel expressly fitted to convey powder; it invariably carries a red distinguishing flag, and warns the ship for which the powder is intended to put out all fires before she comes alongside.

POWDER-MAGAZINE. See MAGAZINE.

POWDER-MONKEY. The boy who passed cartridges to the guns.

POWDER-TANK. A rectangular metallic case,

the sides and bottom being of sheet-copper (tin-coated), and the top of composition. Powder-tanks are made of 4 sizes, though the 200-pound tank is regarded as the standard size for service, the others being issued in special cases only. The calibre, number, and weight of the charges are stenciled upon the lid end, and on the upper side are the marks corresponding to the marks on the barrel from which the powder was taken. In order to distinguish more readily the tanks containing different kinds of powder, the following manner of painting the lids has been adopted:

Service charges.—Plain white, with calibre in red.

Saluting charges.—Half red, half white.

Torpedo charges.—Red T on a white ground.

Shell charges.—Red O on a white ground.

Howitzer charges.—Red H on a white ground.

Rifle charges.—Red R on a white ground.

Shell-powder.—Red S on a white ground.

POWDER-VESSEL. A ship used as a floating magazine.

Powell, Levin M., Rear-Admiral U.S.N. Born in Virginia. Appointed midshipman, March 1, 1817; served as midshipman in the Mediterranean, China Seas, and in the Gulf of Mexico and West Indies for the suppression of piracy.

Commissioned as lieutenant, April 28, 1826; served in the Mediterranean, West Indies, and Gulf of Mexico; before Charleston in the sloop "Natchez" during the nullification troubles; on coast of France pending the demand for payment of the French indemnity, 1834–35; in the West Indies and on the coast of Florida on the outbreak of the Seminole war,—commanding several expeditions against the hostile Indians,—in the last of these was wounded in a fight with them on the head-waters of Jupiter River, in January, 1837; received the thanks of the Navy Department for these services in Florida; commanded two surveying expeditions for the rectification of positions and soundings of the eastern coast and harbors of the Gulf of Mexico; and was commissioned commander, while on this duty, June 24, 1843; appointed assistant inspector of ordnance, October, 1843, and continued on ordnance duty until appointed to command of sloop "John Adams," which sailed for Brazil, July, 1849; served in her on the coast of South America and on the coast of Africa until return, in December, 1850; from 1851 to 1854, executive-officer of the navy-yard, Washington; was in command of the flag-ship "Potomac," cruising in North Atlantic and West Indies, to August, 1856.

Promoted to captain, September 14, 1855; inspector of contract steamers in 1858, and appointed captain of the frigate "Potomac" early in 1861, and sailed for Gulf Squadron, September of the same year; was retired by the act of December, 1861, and from command of the "Potomac," June 30, 1862; inspector of third light-house district from November 7, 1862, to October, 1866.

Commissioned as commodore, July 16, 1862.

Commissioned as rear-admiral, July 25, 1866, and on special service from 1867 to 1872. Retired March 1, 1862.

Power. The amount of work that can be done in a given time; it is the product of force, motion, and time. Its usual unit of measure is one horse-power, or 33,000 foot-pounds per minute.

Pozzolana. Volcanic ashes, used in cement, especially if required under water.

Præcursoriæ. Ancient vessels which led or preceded the fleets.

Prædatoriæ, or Prædaticæ. Long, swift, light ancient pirates.

Præsepe. A bright spot in Cancer which is resolved by the telescope into a cluster of stars; it is called also the *manger*, and sometimes the *beehive.*

Praia. The beach or strand on Portuguese coasts.

Pram, or Praam. A lighter used in Holland, and the ports of the Baltic, for loading and unloading merchant ships. Some were fitted by the French with heavy guns, for defending the smaller ports.

Pratique. A Mediterranean term, implying the license to communicate with any place after having performed the required quarantine, or upon the production of a clean bill of health.

Prawn. A marine crustacean larger than a shrimp, much esteemed as an article of food.

Prayer-book. A small hand-stone used to scrub in confined spaces where a large holy-stone cannot be used. See HOLY-STONE.

Preble, Edward, Commodore U.S.N. Born at Falmouth Neck, the site of the present city of Portland, Me., August 15, 1761; died in Portland, August 25, 1807. He made his first cruise in a privateer in 1777–78, and in 1779 entered the provincial marine of Massachusetts as a midshipman. He was serving on board of the "Protector" at the time of the action between that vessel and the English privateer "General Duff," and greatly distinguished himself in that affair.

Midshipman Preble was shortly afterward captured and confined on board the prison-ship "Jersey," in the harbor of New York. On being liberated he joined the Massachusetts vessel-of-war "Winthrop," on which he remained until 1782, winning new honors by boarding with 14 men an armed brig off Castine, and carrying her out under the fire of an English battery. After peace was declared he entered the merchant service, where he remained for 15 years.

In 1799 he was commissioned a lieutenant in the U. S. navy, and ordered to command the "Pickering," one of the squadron stationed at the Windward Islands. In June, 1799, he was commissioned as captain and given command of the "Essex," in which he convoyed home from Batavia a fleet of 14 vessels.

In 1803, Capt. Preble was ordered to command the squadron sent against Tripoli, his flag-ship being the "Constitution." On his arrival at Tangiers in October, he opened and successfully concluded negotiations which averted a war with Morocco. On November 12 he declared the blockade of Tripoli. The "Philadelphia," 38, Capt. Bainbridge, having run upon the rocks, was captured by the Tripolitans, but was destroyed at her anchorage in the harbor by Lieut. Decatur, on February 16, 1804. (See DECATUR, STEPHEN.) On August 3, his command then consisting of 15 vessels, including 8 small gunboats borrowed from the Neapolitan government, Preble made his first attack upon the enemy's gunboats, protected by batteries on shore. He captured 3 of the largest by boarding, and sunk

3 others. On the 7th he made a second attack, but with less success, the enemy keeping close within the harbor. One of Preble's gunboats was sunk. Another attack was made on the 28th, in which one of the Tripolitan gunboats was sunk and several driven ashore. Preble's flag-ship was closely engaged with the enemy's batteries, and for an hour lay within musket-shot of the mole. On September 3 the fourth attack was made, during which the "Constitution" was badly cut up, but Preble did not withdraw until he had inflicted great damage upon the enemy's batteries.

The "Intrepid," a ketch captured from the enemy, which Lieut. Decatur had used in destroying the "Philadelphia," was converted into a fire-ship, carrying 100 barrels of gunpowder in bulk in the hold, and on the deck immediately above the powder were laid fifty 13½-inch shells and one hundred 9-inch shells, with a large quantity of shot and fragments of iron of different sorts. Capt. Somers volunteered to take command of the "Intrepid," and Lieut. Wadsworth volunteered to serve with him. Commodore Preble personally superintended all the details of preparing this "powder-boat," and the night of September 4, that of the day which succeeded the attack last related, was selected for the purpose. When all was ready the "Intrepid" got under way and stood in towards the western passage, by which she was to enter. The last seen of her she was not a musket-shot from the mole, standing directly for the harbor, which a very few minutes afterwards was illuminated by a fierce light, followed by a concussion that shook the vessels in the offing from trucks to keels. A shot from the enemy's batteries had struck the kedge, and caused her premature explosion. None on board of her escaped, and with them perished the boats' crews from the "Constitution" and "Nautilus," that had been towed in to bring out the crew of the kedge after they had fired their vessels. The "Intrepid" perished a quarter of a mile from the spot she was intended to reach.

On the 10th of September Commodore Barron, in the "President," arrived at Tripoli and relieved Commodore Preble, who soon afterwards sailed in the "John Adams" for home. On his arrival he received a gold medal and a vote of thanks from Congress.

Preble, George Henry, Rear-Admiral U.S.N. Born in Portland, Me., and appointed a midshipman from that State, October 10, 1835; frigate "United States," Mediterranean, May, 1836, to November, 1838; sloop "Warren," frigate "Macedonian," sloop "Levant," and sloop "Erie," West Indies, January, 1839, until September, 1840; Naval School, at Philadelphia, January to June, 1841, when he was warranted passed midshipman, No. 7, in a class of 24; was acting lieutenant of schooner "Madison" and brigantine "Jefferson," on the Florida Expedition, from August, 1841, to August, 1842; went on several canoe expeditions into the everglades, and returned with the expedition sick; in receiving-ship "Ohio," at Boston, from October, 1842, to May, 1843; acting master and acting lieutenant in sloop "St. Louis," East Indies, and circumnavigating the world, May, 1843, to September, 1845; had charge of first American armed force ever landed in China, for the protection of American consulate and residents of Canton, June and July, 1844; acting master and executive of schooner "Petrel," in the Gulf of Mexico, May, 1846, to May, 1847; participated in surrender of Alvarado, Laguna, Tampico, and Panuco, and assisted at siege, etc., of Vera Cruz; returned to United States in ship-of-the-line "Ohio," sick, May 31.

Warranted as master, July 15, 1847.

Commissioned as lieutenant, February 5, 1848; returned to the Gulf in sloop "Saratoga," February, 1848, and came home sick, March, 1849; executive-officer of steamer "Legree," coast survey, April, 1849, to January, 1851; from January to August, 1851, in frigate "St. Lawrence," which conveyed American contributors to World's Fair, at London, and then conveyed our minister to Lisbon; commanding schooner "Gallatin," etc., coast survey, August, 1851, to December, 1852; December, 1852, to March, 1853, attached to the "Vermont," 74; on Japan Expedition and in China waters, from April, 1853, to August, 1856, in "Macedonian," and commanding chartered steamer "Queen"; assisted in the surveys of Jeddo and Hakodadi Bays; and also surveyed the harbor of Kealung, island of Formosa, his chart of which is published in the official report of the expedition; was on several successful expeditions against pirates in China, and received the thanks of Commodore Abbot and of the English admiral, Sir James Stirling, for the part taken by him in the one to Kulan; commanded an expedition to Foo-chow-foo, in the American steamer "Confucius," destroying several pirate junks; prepared sailing directions for Shanghai, which were published by the English and U. S. governments, and in several private editions; was light-house inspector of first district (coast of Maine and New Hampshire) from September, 1856, to October, 1857; at navy-yard, Charlestown, Mass., October, 1857, to September, 1859; executive-officer of steam-sloop "Narragansett," Pacific Squadron, September, 1859, until November, 1861, and ordered home at his own request to serve on the Atlantic coast; in January, 1862, took command of the steam-gunboat "Katahdin," equipping at Boston, and, March 29, reported to Admiral Farragut, West Gulf Squadron; passed the forts with the fleet, April 24, 1862, engaged the enemy's fleet, and was at the attack upon the lower defenses and at the surrender of New Orleans; participated in all of Farragut's operations on the river that year, as far as Vicksburg, assisting in destroying Grand Gulf; August 4, 1862, was transferred to the command of the steam-sloop "Oneida"; while steaming up the river above New Orleans, at night, August 8, the "Oneida" was purposely run into by the steamboat "Lewis T. Whitman," and although every effort was made to save her crew and passengers (70 of whom were saved), many lives were lost. Her rebel captain was sent to New Orleans in irons, and after his release served upon the steam-tug "Boston," and conveyed her to the rebels at Mobile.

Commissioned as commander, July 16, 1862; on the blockade off Mobile, August 25 to October, 1862; on August 29 he was left senior officer present, four vessels out of seven of our usual blockading force having left for coal and repairs; on September 4, about 6 P.M. a steamer flying

English colors, and having every appearance of one of her Britannic majesty's gunboats, approached the bar, and was met by our vessels under way; the "Oneida" fired three shots across the stranger's bow, the last at her fore-foot, without bringing her to; and then, within three minutes of the first gun, fired a broadside into her, and continued the chase, with the other vessels, until she, from her superior speed, was enabled to run in over the southeast shoals under cover of Fort Morgan's guns. This steamer proved to be the rebel cruiser "Oreto," afterwards called the "Florida." Her commander subsequently wrote as follows:

"I can vouch for his (Preble's) promptness and destructive energy on the occasion of my entering Mobile Bay. The superior speed of the 'Florida' alone saved her from destruction, though not from a frightful mauling. We were torn to pieces,—one man's head taken off, and 11 wounded; boats, standing- and running-rigging shot away, also foregaff. Four shells struck our hull, and had the one (11-inch) that grazed our boiler and entered the berth-deck (killing one and wounding two) exploded, every man belonging to the steamer would have been killed, as I had only the officers on deck, until about to cross the bar, when I made some sail, and one man was wounded in the rigging; we had about 1400 shrapnel-shot (balls) in our hull, and our masts were pitted like a case of smallpox. The damage done her was so great that we did not get to sea again for over three months."

For not preventing the "Oreto's" running the blockade, Commander Preble was summarily dismissed from the naval service, by order of September 20, 1862, but was nominated to the Senate by the President, and on recommendation of the Naval Committee was, on February 21, 1863, confirmed and restored to his proper rank and position as a commander, the injustice of his summary dismissal being generally admitted. April 9, 1863, agreeably to orders from the Navy Department, proceeded *via* England to Lisbon, and June 3 took command of the sailing-sloop "St. Louis" at the latter port, and ordered to cruise for rebel corsairs between Lisbon, the Azores, Canary Islands, and Gibraltar. Though requesting more active duty, and command of a steamer on the coast, he was in command of the "St. Louis," cruising within those limits, until ordered to Port Royal, S. C., September 3, 1864, once falling in with his old foe, the "Florida," at Madeira, and preventing her from getting a full supply of coal, but not able to prevent her from running out in a calm. He gave chase as soon as he got wind, but of course did not catch her.

Reported to the admiral November 2, 1864; took charge of the coal depot, and blockaded in the North Edisto until November 24, when he was ordered to command the fleet brigade then organized by Admiral Dahlgren at Port Royal, to co-operate with an army force designed to assist Gen. Sherman's approach to the coast; this brigade, consisting of naval artillery, sailor infantry, and a marine battalion, 493 all told, joined an army force under Gen. J. P. Hatch at Boyd's Neck, and on November 30, 1864, engaged in the severe battle of Honey Hill; it also took part in the actions of the 6th, 7th, and 9th of December on De Vaux's Neck, and was daily under fire until withdrawn on December 28; the general orders and written commendations of Rear-Admiral Dahlgren and Gens. Foster, Hatch, and Porter, were gratifying to all connected with the brigade (see Secretary of Navy's Report, 1865); April 4, transferred to the command of the steamer "State of Georgia," and proceeded to Aspinwall to look after American interests; his vessel and the "Huntsville" rescued 600 or 700 passengers from the wrecked steamship "Golden Rule," near Aspinwall; in acknowledgment of this service he received the thanks of the rescued people, transmitted through the Navy Department; the "State of Georgia" returned to New York, and went out of commission September 11, 1865. At Boston Navy-Yard as general inspector of supplies, from October 14, 1865, to July 5, 1867, and continued as equipment-officer until July, 1868; chief-of-staff, North Pacific Squadron, from August, 1868, until December 19; commanding the flag-ship "Pensacola," 1868–70.

Commissioned as captain, March 16, 1867, to take rank from January 29, 1867; commanding naval rendezvous, Boston, 1871–72.

Commissioned as commodore, November 2, 1871; commanding navy-yard, Philadelphia, 1873–75; special duty, 1876.

Commissioned as rear-admiral, September 30, 1876; commanding South Pacific Station, 1877–78. Retired February 25, 1878.

Precession of the Equinoxes. The equinoctial points have a backward movement along the ecliptic of about 50″ annually, caused by the unequal attraction of the sun and moon on the equatorial belt. The number of seconds in the zodiac divided by the annual motion of the equinox gives the time in which it will make the entire circuit of the ecliptic; it is about 25,870 years. From a similar computation it is supposed that the zodiac was divided into signs about 2500 B.C. See EQUINOXES, ZODIAC.

Preparing for Sea. The performance of certain duties previous to leaving port, by which the vessel will be rendered efficient, and additional security given to the equipment and outfit.

These duties are connected with all of the different departments of the vessel. The preparations to be made may vary under different circumstances, but the following requirements should be generally observed.

Provisions in sufficient quantity should be on board and properly stowed. Fill water-tanks and casks with fresh water, unless that is to be done by distillation after leaving port. If a steam-vessel, have a sufficient supply of coal on board, have fires ready for lighting, and hoist the smoke-stack.

The battery must be secured for sea with extra tackles and lashings, the muzzle-bags put on and the ports closed. Bend sails and all sail-gear, take off sail-covers, and have everything in readiness for making or shortening sail.

Put on chafing-gear. Cross light yards, or place them in the rigging ready for sending aloft. Send up rolling and pendent tackles, if required, and have storm-sails and their gear easy of access. Hoist all boats and secure them. Life-boats must be kept in readiness for lowering at a moment's notice.

Take in accommodation-ladders. Secure lower booms alongside, unhooking the topping-lifts and stopping them on the fore-yard. Top the

spanker-boom up clear of the crotch, and see that the life-buoys are in order.

Hand lead-lines must be placed in the chains, and the deep-sea lead and line should be ready for use. Log-lines and time-glasses should be measured and compared to insure their correctness, and the wheel-ropes and tiller examined, that they may be in working order.

Loose articles on all the decks should be securely lashed. Close lower-deck air-ports, and, previous to getting under way, take the vessel's draft.

Preparations must also be made for getting under way. Reeve the cat- and fish-falls, bring the chain to, and rig the capstan.

In all ports where quarantine regulations are enforced, care must be taken to have a bill of health, certified by the proper authority.—*E. T. Strong, Lieutenant U.S.N.*

Press-gang (*Eng.*). A party of seamen who (under the command of a lieutenant) were formerly empowered, in time of war, to take seafaring men—on shore or afloat—and compel them to serve on board men-of-war. Those who were thus taken were called *pressed men.* See IMPRESSMENT.

Press of Sail. As much sail as the state of the wind and sea will permit a ship to carry.

Pressure-gauge. An apparatus to indicate the pressure of fluids; there are many different kinds, and they may be divided into two principal classes: *first*, those which act by the effect of pressure (either direct, or transmitted by pistons, or elastic diaphragms) on a column of mercury; and, *second*, those which depend for their action upon the elasticity of metals, in which the pressure acts against a corrugated plate, within a corrugated box, in resisting a spiral spring, or in tending to straighten a bent tube, the cross-section of which is usually elliptical, but may be any form except circular.

Preston, Samuel N., and Porter, Benjamin H., Lieutenants U.S.N. Samuel N. Preston was appointed to the Naval Academy from the State of Illinois in October, 1858. Being a diligent student, he always stood foremost in his studies, and, graduating first in his class, he was on the 9th of May, 1861, detached and assigned to duty on board of the U. S. S. "Wabash," in the South Atlantic Blockading Squadron, being on the 1st of August, 1862, promoted to the grade of lieutenant, and ordered to duty as flag-lieutenant on the staff of Rear-Admiral Dahlgren.

He participated with distinction in the combined army and navy attacks on Fort Wagner, July 10 and 11, 1863, being complimented highly by the admiral for his gallant conduct.

He commanded the third division of the assaulting-party in the attempt on Fort Sumter, September 8, 1863, which was repulsed with great slaughter, and he, with many other officers,—among them his friend Benjamin H. Porter,—was taken prisoner and afterwards confined in Libby Prison, where he remained until exchanged, in the fall of 1864.

Benjamin H. Porter was appointed to the Naval Academy from the State of New York on November 29, 1859, and remained a student there until November 8, 1862, when he was commissioned ensign and ordered to duty in the South Atlantic Blockading Squadron, serving in turn with great credit on board of the U. S. S. "Ellis," "Canandaigua," and "New Ironsides," displaying on numerous occasions such energy, courage, and ability in the discharge of his duties as to win the admiration of his commanding officers and compliments from the admiral in his communications to the Department.

In the attack on Fort Sumter on the 8th of September, 1863, he was among those who were taken prisoners, remaining in Libby Prison until released and exchanged, in the fall of 1864.

Both of these gallant young officers, as soon as they were free, applied for immediate active duty, and in December, 1864, were assigned to duty under Rear-Admiral David D. Porter; Lieut. Preston being made his flag-lieutenant, and Lieut. Porter being given the command of the flag-ship "Malvern." They were present in the bombardments of Fort Fisher on the 24th and 25th of December, 1864, and in the land attack on that fort made by the sailors from the fleet both were assigned to duty of great responsibility, and fell nobly at the head of their men in the gallant discharge of that duty.

Side by side these young officers went through their careers. Together they were students at the Naval Academy; they served in the same squadron, were fellow-prisoners amid the horrors of Libby Prison, and together they fell gloriously at Fort Fisher,—fine types of able, zealous, and brave officers.

A fitting tribute was paid them by Fleet-Capt. K. R. Breese, who, in reporting their loss, says:

"Preston, after accomplishing most splendidly the work assigned him by you, which was both dangerous and laborious, under constant fire, came to me as my aid for orders, showing no flagging of spirit or body, and returning from the rear, whither he had been sent, fell among the foremost at the front, as he had lived, the embodiment of a United States naval officer. Porter, conspicuous by his figure and uniform, as well as by his great gallantry, claimed the right to lead the headmost column with the 'Malvern's' men he had taken with him, carrying your flag, fell at its very head.

"Two more noble spirits the world never saw, nor had the navy two more intrepid men. Young, talented, and handsome, the bravest of the brave, pure in their lives, surely their names deserve something more than a passing mention, and all worthy to be handed down to posterity with the greatest and best of naval heroes."—*F. P. B. Sands.*

Preventer. A term applied to ropes, etc., when used as additional securities to aid other ropes in supporting spars, etc., during a strong gale; as preventer-backstays, braces, etc.

PREVENTER-BOLTS. Bolts passing through the lower end of the preventer-plates.

PREVENTER-PLATES. Short plates of iron bolted to the lower part of the chain-plates to help take the strain.

Price, Cicero, Commodore U.S.N. Born in Kentucky. Appointed midshipman from that State, February 1, 1826; frigate "Macedonian," Brazil, 1826–28; sloops "Erie" and "Shark," West Indies, 1829–31.

Promoted to passed midshipman, April 28, 1832; brig "Boxer," 1834–37, and "North Carolina," 1837–38, Pacific Squadron.

Commissioned as lieutenant, September 6,

1837; steamer "Fulton," Atlantic coast, 1840; in "Delaware," 74, Brazil and Mediterranean, 1841–43 and part of 1844; receiving-ship at New York, 1845; sloop "Marion," coast of Africa, 1846; sloop "Marion," Mediterranean, 1848–49; navy-yard, Memphis, 1850; Pacific Squadron, 1851; ordnance duty, 1853; receiving-ship at Norfolk, 1854.

Commissioned as commander, September 14, 1855; first lieutenant of sloop "Constellation," Mediterranean, 1855–56; commanding "Huntsville," 1861.

Commissioned as captain, July 16, 1862; commanding sloop "Jamestown," East Indies, 1862–65.

Commissioned as commodore, September 28, 1866. Total sea service, 21 years and 1 month; shore or other duty, 6 years and 1 month. Retired December 2, 1867.

Pricker. A small fid or marling-spike for making and stretching the holes for points and robans in sails.

Pricking a Sail. Middle-stitching the seams of old sails, or of storm-sails.

Pride of the Morning. A misty dew at sunrise; a light shower; the end of the land breeze followed by a dead calm in the tropics.

Primary Planet. See PLANET.

Prime. To carry water with the steam from the boiler to the cylinder of a steam-engine; caused by insufficient steam room in the boiler, resulting in the pressure being reduced below that due to the temperature, by dirty feed-water, and by running from salt water into fresh, which boils at a lower temperature.

To get a gun ready for firing by pricking the cartridge and inserting the primer. In firing salutes, the vent is sometimes partly filled with loose powder to insure instantaneous ignition. *To prime a fire-ship*, to lay the train to set it on fire.

PRIMER. Percussion- and friction-primers are generally in use, though electric primers may be used in special cases. The *percussion-primer* consists of a quill tube filled with grained powder, and surmounted by a wafer-head containing a detonating composition of fulminating mercury and mealed powder. The lower end of the tube is closed by dipping it in black varnish, and the whole is coated with shellac. The *friction-primer* is a brass tube 1.5 inches in length and .19 inch in diameter, filled with fine-grained powder, and having near the head a small spur .44 inch long and .15 inch in diameter. In this spur is a brass wire, the inner end being flattened and having serrated edges. The composition in the spur is composed of two parts of sulphuret of antimony and one part of chlorate of potassa. The outer end of the wire is formed into a loop, into which the lock-string hooks. A longer tube is furnished for firing guns with very thick walls. The *quill* friction-primer consists of two quills, one within the other, the lower end being filled with fine-grained powder, and the upper with a sensitive composition composed of 55 parts of antimony trisulphide, 37 parts of potassium chlorate, 5 parts of flowers of sulphur, and 3 parts of gum arabic. In the composition are imbedded wires, which, upon being hauled out, cause the ignition. *Electric primers* are sometimes used in firing salutes, and may be used in firing in a seaway, the rolling of the ship closing the circuit when the deck forms a certain angle with the horizon. This automatic firing is, as yet, but a matter of experiment.

PRIMING-WIRE. A wire used in pricking the cartridge when it is home.

Prime Vertical. That vertical circle which passes through the east and west points of the horizon. Its poles are therefore the north and south points, and its plane is perpendicular not only to that of the horizon, but also to that of the meridian.

Primitive Plane (Lat. *primitīvus*, the first of a system). In projections the primitive plane is that on which the surface to be represented is delineated.

Prise. To raise, or slue, weighty bodies by means of a lever-purchase or power.

Prismatic Compass. A compass so fitted that, when a bearing is observed with it, the graduation of the card is read off by reflection from the interior surface of a prism. This prism is a solid piece of glass, whose sides are parallelograms and ends triangles.

Prisoner at Large. A prisoner not in irons or in confinement.

Prisoner of War. Such captured enemy as is protected by the state, or one in whom the captor claims a right of property and ransom. Before the 16th century they were treated as pirates. See PAROLE.

Prison-ship. One fitted up for receiving and detaining prisoners of war.

Pritch. A dentated weapon for striking and holding eels

Privateer. A private armed vessel, commissioned by the government in time of war, to prey upon the commerce of the enemy.

In ancient Rome, in the time of Cato and Cicero, it was held that no one but a regularly enrolled soldier could lawfully kill an enemy; but later, the law of Solon, by which individuals were permitted to associate themselves for the purpose of plundering enemies, was adopted by the Romans, and has been in effect transmitted to our times. No commission for such a purpose was necessary until the 15th century, nor did the practice of granting commissions to privateers become general till the war between Spain and the revolted Netherlands, at the end of the 16th century. The question whether a commission is necessary to give to private armed cruisers, in time of war, the character and immunities of lawful combatants has been much discussed, and in the United States the doctrine of the law of nations is considered to be, "that private citizens cannot acquire a title to hostile property, unless seized under a commission, but they may still seize hostile property in their own defense. If they depredate upon the enemy without a commission they act upon their peril, and are liable to be punished by their own sovereign; but the enemy is not warranted to consider them as criminals, and, as respects the enemy, they violate no rights by capture." It may be said, however, that the present state of sentiment among enlightened nations would render the practical application of this doctrine highly dangerous, and that hostilities on the part of a cruiser without commission would doubtless expose the offending party to the most rigorous treatment. At the Congress of Paris (1856) the plenipotentiaries of Great Britain, Austria, France, Russia, Prus-

sia, Sardinia, and Turkey united in a declaration that "privateering is and remains abolished." The United States, however, has never assented to this declaration, and as to it, therefore, privateering remains legitimate. See INTERNATIONAL LAW, 10; PARIS, DECLARATION OF.

PRIVATEERSMAN. One of the crew of a privateer.

Private Signal. A signal intelligible only to those having the key.

Prize. A captured vessel or other property taken in naval warfare. The right to all captures vests primarily in the sovereign, and no individual can have any interest in a capture by a public or private vessel except what he receives under the grant of the state. See INTERNATIONAL LAW, 11.

PRIZE-COURT. The court whose jurisdiction includes the adjudication and disposition of prizes. See INTERNATIONAL LAW, 12.

PRIZE-GOODS. Those taken upon the high seas —*jure belli*—from the enemy.

PRIZE-LIST. A return of all the persons on board, whether belonging to the ship or supernumeraries, at the time a capture is made; those who may be absent on duty are included.

PRIZE-MASTER. The officer to whom a prize is given in charge to carry her into port.

PRIZE-MONEY. Proceeds of the sale of captures made as prize by authority of the United States. Vessels and their cargoes captured as prize must be sent into port for an adjudication in a prize-court in the manner prescribed by law. If condemned, the property is sold by the U. S. marshal, and the proceeds, when the capture was by a vessel or vessels of the navy, disposed of according to the decree of the court. If the prize was of equal or superior force to the vessel or vessels making the capture, the whole of the net proceeds will be decreed to the captors; and when of inferior force, one-half will be decreed to the United States and the other half to the captors. The prize-money adjudged to captors is distributed in the following proportions:

First. To the commander of a fleet or squadron, one-twentieth part of all prize-money awarded to any vessel or vessels under his immediate command.

Second. To the commander of a division of a fleet or squadron, on duty under the orders of the commander-in-chief of such fleet or squadron, a sum equal to one-fiftieth of any prize-money awarded to a vessel of the division under his command, to be paid from the moiety due the United States, if there be such moiety; if not, from the amount awarded to the captors. This fiftieth part is not awarded in addition to the share he would be entitled to as commander of a single ship making a capture, and he may elect which he will receive.

Third. To the fleet-captain, one-hundredth part of all prize-money awarded to any vessel of the fleet in which he is serving, except where the capture is made by the vessel on board of which he is serving, in which case he will share, in proportion to his pay, with the other officers and men on board such vessel.

Fourth. To the commander of a single vessel, one-tenth of all the prize-money awarded to the vessel, if such vessel at the time of the capture was under the command of the commanding officer of a fleet or a division, and three-twentieths if his vessel was acting independently of such superior officer.

Fifth. After the foregoing deductions, the residue is distributed among all others doing duty on board, and borne upon the books of the ship, including the fleet-captain, in proportion to their respective rates of pay.

All vessels of the navy within signal-distance of the vessel making the capture, and in such condition as to be able to render effective aid if required, will share in the prize. Any person temporarily absent from his vessel may share in captures made during his absence. The prize-court determines what vessels shall share in a prize, and also whether the prize was of superior, equal, or inferior force to the vessel or vessels of the captors. The Secretary of the Navy determines what persons are entitled to share in the prize-money awarded a vessel, and transmits their names to the Fourth Auditor, who ascertains, according to the above rules of distribution, the correct amount of each person's share. On application the Auditor will issue a certificate payable to the person entitled, provided Congress has authorized the payment by an appropriation. See BOUNTY FOR DESTRUCTION OF ENEMY'S VESSELS.

The share of prize-money awarded to the United States is set apart forever as a fund for the payment of pensions to naval officers, seamen, and marines entitled to pensions; and, if more than sufficient for that purpose, the surplus is applied to the making provision for the comfort of disabled officers, seamen, and marines. The Secretary of the Navy is trustee of the naval pension fund, and the fund is invested in securities of the United States bearing 3 per cent. interest. See NAVY PENSION FUND.

Privateers, and vessels not in the navy, but controlled by other executive departments of the government, do not come within the above provisions, but are entitled to prize-money under laws relating especially to themselves.

Proa. See FLYING PROA.

Probation. The novitiate period of cadets.

Procyon (Gr. *prokuōn;* from *pro*, before; *kuōn*, a dog, so called from its rising before Sirius). The proper name for the bright star *α Canis Minoris.* It makes an equilateral triangle with Sirius and Betelguese. See CANIS MINOR.

Professors of Mathematics. These officers were first appointed in the U. S. navy in 1831, for the purpose of instructing midshipmen on board ship, but such instruction has been found unprofitable, and latterly no professors of mathematics have been employed at sea. A limited number have been continued on the list at the Naval Academy and Naval Observatory. The first to receive the appointment was Prof. Elisha Fitch, September 25, 1831, who died October 15, 1839. At the present time there are 12 professors of mathematics in the navy on the active list, 3 having the relative rank of captain, 4 that of commander, 5 of lieutenant, and on the retired list 1 with rank of commodore, 3 of captain, and 2 of commander.

Projectiles. A projectile is properly, from its derivation, anything that is thrown forward, and may therefore not only refer to missiles to be employed against an enemy, but, as well, to signals of danger in peace times, or to the means employed to carry a line to the crew of a stranded

or sinking ship. In this article it will be treated in its former significance.

The first projectiles used were stones thrown from slings (afterwards lead bullets were projected in the same way), arrows from the long bow, and darts and javelins thrown by hand. In the sieges of walled towns, in very early days, ballistæ and catapults were used as a species of heavy ordnance, the former to hurl large stones, and the latter, wooden beams shod with iron and often covered with inflammable material previously ignited. But the projectile, as it is understood in modern times, came in with the use of gunpowder in warfare, and developed with the improvements in weapons using it. While lead answered all the purposes in small-arms, it was found too soft for battering with larger guns, and stone shot being not only too light for good flight, but also deficient in tenacity, early gave way to iron, which excelled in these qualities. Iron projectiles came into general use in Europe by the close of the 14th century, and by the middle of the succeeding century, grenades and explosive shells were introduced. The first ones are said to have been made of alloys of lead and tin and of bronze, but later they gave way to cast iron, and in many cases were of extraordinary size, reaching in Germany and Italy, towards the close of the 17th century, to 1100 and 1300 pounds weight. These shell were projected from mortars, and it was not until early in this century that shell-guns came into use, first in this country and afterwards in Europe. From this time up to the advent of rifle-guns, projectiles for heavy ordnance were not materially changed, except that they grew in size with the increasing calibre of the guns, were cast more carefully and by better methods, and the effect of the shell was heightened by improvements in the fuzes.

In smooth-bore guns, besides solid shot and shell, several other projectiles are used, such as "case-shot," which comprise "grape" for spreading a large number of balls at short range, "canister" for longer distances, and "shrapnel," which are thin shell containing small balls, and with a bursting charge just sufficient to rupture the shell. Other types of projectiles for smooth-bore guns are now obsolete in our service, such as chain- and bar-shot for cutting an enemy's spars, sails, and rigging, and hot shot and carcasses for setting him on fire, although the latter might be used with good effect on shore, and several European governments retain them, as well as "ground" and "parachute light-balls," to light up an enemy's works at night, and "smoke-balls" to appeal to his nose. Many of these projectiles had prototypes in the hot clay, hot iron, Greek fire, and stink-pots of the ancients.

The first rifled motion was given to spherical lead bullets fired from small-arms about the close of the 15th century, but the practice seems to have soon fallen into disuse, to obtain again nearly 200 years afterwards, and we have records of the good effects produced by the rifle in our Revolution. Several improvements in rifling and loading were introduced early in this century, and finally led up to the elongated bullet having a conical head, the rammer-head being recessed to prevent flattening out the point in loading. The Minié bullet was introduced in 1847. This is a cylindrical body with a conical head, and at the base is an iron thimble which, driving in at discharge, wedges the lead out into the grooves of the rifle. But it was soon discovered that a concave surface at the rear face of the bullet did quite as well as the thimble, which in some cases was driven through the bullet. The present service bullet has a concave base, and 3 grooves in a transverse plane at the forward end of the cylinder. They are made of an alloy of 16 parts lead to 1 of tin, are punched out in steel dies, and for the .45 calibre are of the following dimensions, in inches: Total length, 1.11; diameter of cylindrical part, .458; maximum diameter of conical part, .445; depth of grooves, .03; width of grooves, .125; width of lands, .083; weight in grains, 405. Experiments have lately been made with a bullet of 500 grains, using the same charge of powder (70 grains); and while the initial velocity has been less, the range has been increased, with a flatter flight during the falling part of the trajectory.

The rifling of heavy ordnance is of very recent date, for although Benjamin Robins, as early as 1742, foresaw its advantages and those of the elongated projectile, and while there are crude specimens preserved in the museums of some European countries, which date back still farther, it was not until 1854, before Sebastopol, and again in 1859, in the Italian campaign, that rifled cannon were employed with good effect. The war of secession soon following, and the use of armor for the protection of fighting ships, stimulated invention in ordnance to a great degree, and rang the death-knell of smooth-bore guns and spherical projectiles. Notwithstanding the immense amount of thought and study that has been expended on the subject of rifled guns and their projectiles, the question is far from being settled, and of the many systems proposed and in use, each has its warm advocates. The flight of an elongated projectile depends primarily upon its taking the rifled motion, and the steadiness with which it retains it about its longer axis. The devices for rotating the projectile are many, and their success depends mainly on the strength of the gun, the strength of the projectile, and the action of the powder-gases. A comparatively weak gun, with a good system of rifling and of projectiles, will stand where a much stronger gun may be burst by undue strains put upon it by a bad system. The devices now used for securing the rifled motion may be classed under three heads, viz., studded or flanged, forced or lead-coated, and expanding. Studded projectiles have buttons or flanges which follow corresponding grooves in the gun, as in the Woolwich and Armstrong muzzle-loaders. Forced projectiles are used in breech-loaders only, and are coated with lead or other soft substance to a size larger than the bore of the gun. Examples are shell and shrapnel for the 3-inch breech-loading navy howitzer, and projectiles for Krupp and Armstrong breech-loaders. Expanding projectiles are those where the action of the powder-gases expand into the grooves of the gun a soft rear band, as in the Parrott, Butler, Stafford, and Blakely systems, or a lead zone is forced out by a cap-wedge driven up from the rear, as in the Hotchkiss, or a papier-maché base is driven up on the shot, as in the Schenkl.

The object to be attained is, with the least

strain on the gun, to get a steady, uniform motion without balloting or wedging in the bore, no stripping, uniformity of range and velocities, and a steady flight. Besides these qualities a shell should have large capacity for a bursting charge, and all projectiles should be free from liability to injury in ordinary handling or transportation. Precautions should be taken in cleaning, filling, and fuzing shell to prevent premature explosions. Shell are generally made of cast iron and fuzed at the point. Battering shell are cast with a chilled head and not fuzed, while the walls are much thicker, the bursting of the shell being effected by the heat generated by impact against armor. Steel projectiles are now being made abroad, and used against armor shields with excellent results. At the recent Meppen experiments they excelled all others.

During the war many kinds of shell of each system were used, including not only inventions of our own citizens, but some purchased from other countries. The greatest number of shell used on the Northern side were Parrott, Hotchkiss, and Schenkl. That our ordnance officers, after much experience, should have adopted the expanding system with base rotation in all muzzle-loading guns argues strongly in its favor. Our breech-loaders are few, but in the navy, Parrott shell are used in them, with the exception of the 8-inch breech-loading howitzer, and in recent firing with the 9-inch breech-loading rifle, Butler shell were used.—*H. W. Lyon, Lieutenant U.S.N.*

Projection (Lat. *projectio*, a throwing out or stretching forth). A delineation of a proposed figure on a given surface, formed by means of lines drawn according to some definite laws. The projection of a surface is generally conceived as made by straight lines, and on a plane. This plane is called the *primitive plane*. A distinction is also drawn between *natural* and *artificial* projections. A *natural projection* of a surface on a given plane is such a delineation of it as would be formed by drawing straight lines from the eye in a definite position through every point of the surface to meet the plane, the original and the representation producing the same effect on the organ of vision. An *artificial projection* is a delineation of the surface on a plane traced according to fixed laws, not being a perspective representation.

Projections of the Sphere. Delineations of the surface of the sphere on a plane made according to definite laws, and furnishing the means of constructing maps and charts. Projections of the sphere are either *natural* or *artificial*. Natural projections of the sphere are delineations of the surface on a plane, defined in position, representing the sphere as it appears to the eye situated at a given point. According to the relative positions of the sphere, the eye, and the primitive or plane of projection, there are different methods of natural projection, the three most important of which are the *orthographic*, *stereographic*, and *central* or *gnomonic*. In the *orthographic* the eye is indefinitely distant from the sphere, so that the visual rays are parallel to one another, and the primitive is perpendicular to their direction; in the *stereographic* the eye is situated at the surface of the sphere, and the primitive passes through the centre so as to have the eye in its pole; in the *central* or *gnomonic* the eye is at the centre of the sphere, and the primitive is a tangent plane. Projections of the sphere, on whichsoever of the above methods they are made, are further named *equatorial*, *meridional*, or *horizontal*, according as the primitive coincides with or is parallel to the equator, the meridian, or the horizon. All perspective representations of the sphere distort those parts which are not projected near the centre of the primitive. Thus, in a map on the orthographic projection, countries at a distance from the centre of the primitive are unduly contracted, while the reverse is the case in maps on the central projection. In maps or charts of small portions of the earth's surface this is of little consequence, as the middle of the map may be always taken for the centre of the primitive; but for extensive tracts the distortion near the edge of the map is considerable, and constitutes an objection. Artificial projections of the sphere are delineations of the surface on a plane traced according to fixed laws, not being perspective representations. *Mercator's* chart, which is that of the greatest importance to the navigator, is an artificial projection. Here the meridians are parallel straight lines equidistant from each other, the parallels of latitude are perpendicular to the meridians at such distance from each other, increasing from the equator, that the measures of a degree of longitude and latitude at any point of the projection shall have the same ratio as exists between their measures on the surface of the sphere at the corresponding point. This projection gives a true representation as to *form* of every particular small tract, but varies greatly in point of *scale* in its different regions, the polar portions in particular being extravagantly enlarged, and the whole map even of a single hemisphere not being comprisable within any finite limits. See Chart.

Promiscui Usus. A law-term for those articles which are equally applicable to peace or war.

Promontory. A high point of land or rock projecting into a sea or lake, tapering into a neck inland, and the extremity of which, toward the water, is called a cape, or headland, as Gibraltar, Ceuta, Actium, etc.

Promotion. Promotions are made by seniority only, except in cases of extraordinary heroism. When an officer arrives at the head of his grade he must undergo examinations in regard to his physical and professional qualifications, and his record is consulted in respect of his moral character. See Examination, Board of.

Promovent (*Eng.*). The plaintiff in the instance-court of the admiralty.

Proof. The trial of arms, ammunition, etc., before being received for service.

Propeller. An instrument for propelling vessels. There are two principal kinds, the paddle-wheel and screw-propeller. The paddle-wheel may be worked by either horizontal or vertical shafts, and the paddles are either fixed or feathering. The action of the screw-propeller is that of a two or more threaded screw working in a nut, the water acting as the nut; but being a moving medium, the full benefit of the pitch is not obtained. See Paddle-wheel, Screw-propeller.

Proper Motion. See Motion, Proper.

Proportional Parts, Table of. An auxiliary table to facilitate the process of interpolation in the use of logarithms.

Prospect-glass. An old term for a spy-glass.

Protractor. An instrument for laying off angles in plotting.

Providence, R. I., the second city in population, wealth, and importance of the New England States, is situated around a little lake called the "Cove," into which two small rivers, the Woonasquatucket and Moshassuck, empty, and on Narragansett Bay, at the head of navigation. The Providence River, which flows out of the "Cove," is on the southeastern side of the city, and the Seekonk forms its eastern boundary. Providence was at one time the seat of a considerable foreign and domestic commerce, but of late years the foreign trade has considerably diminished, balanced, however, by an increase of the domestic trade. This city is one of the great manufacturing centres of the country. The most important establishments are those of the Gorham Company, manufacturers of solid silverware, the Providence Tool Company, Providence Steam-Engine Company, Barstow Stove Company, Allen Fire Supply Company, Fletcher Manufacturing Company, Corliss Steam-Engine Works, and many others, the total value of the manufactures according to the State census for 1875 being $52,000,000. Pop. 104,000.

Proviso. A stern-fast, or hawser, carried to the shore to steady by. A ship with one anchor down and a shore-fast is moored *a proviso*.

Provost-marshal. This term is applied in the navy to an officer who is charged with the safe-keeping of a prisoner while undergoing trial by court-martial. He does not arrest him, or execute the sentence of the court, as in armies, but receives him from the officer in whose custody he may be held, and is responsible for him in transit, and while before the court, and for his return when his presence is no longer required. The president of a general court-martial is authorized to order an officer of the navy not above the grade of lieutenant, or an officer of the marine corps not above the grade of captain, to serve as provost-marshal of the court. In addition to the above, it is his duty to serve notices to the witnesses, execute any process of the court, and attend generally as the police-officer of the court. He is not sworn, and receives no additional compensation. In the case of a trial of an appointed or enlisted man, the person to act as provost-marshal may, if the president of the court thinks proper, be a petty officer of the navy, or a non-commissioned officer of marines. It has not been the practice in the U. S. army for a provost-marshal to attend upon a military court.—*H. C. Cochrane, Captain U.S.M.C.*

Pucka. A word in frequent use among the English in the East Indies, signifying sterling, of good quality.

Pucker. A wrinkled seam in sail-making; also, anything in a state of confusion.

Puddening, or Pudding. A thick pad of yarns, matting, oakum, etc., tapering from the middle toward the ends; used for fenders on the bow of a boat. A covering of parceling and soft rope over the ring of the anchor when rope cables are used.

Pudding-fish. A fish of the genus *Sparus* (*S. radiatus*).

Puff. A sudden gust of wind.

Puffer. A fish of the genus *Diodon;* globe-fish. See GLOBE-FISH.

Puffin. The *Fratercula arctica*, a sea-bird with a singular bill, formerly supposed to be a bird in appearance but a fish in substance, in consequence of which notion the pope permitted its being eaten in Lent.

Pulas. An excellent twine, made by the Malays from the *kaluwi*, a species of nettle.

Pull. To row.

PULL-AWAY BOYS. A name given on the west coast of Africa to the native Kroomen, who are engaged by the shipping to row boats and do other work not suited to Europeans in that climate.

Pull Foot. To hasten; to run.

Pulo. The Malay word for island, and frequently met with in the islands of the Eastern seas.

Pulwar. A commodious kind of passage-boat on the Ganges.

Pump. A hydraulic machine for raising liquids. A machine for exhausting a gas from, or forcing a gas into, a close vessel. *To pump ship*, to pump the water out the bilge. A pump *sucks* when the water being exhausted, nothing but air comes up.

PUMP-BRAKE. A lever by which a pump is worked.

PUMP-DALE. A trough to carry off water from a pump; a hose is now used for this purpose.

PUMP-GEAR. The apparatus belonging to a pump.

PUMP-WELL. An inclosure around the bottom of the pumps to protect them from injury, and to give a ready admittance to the water, as well as to permit an examination into the condition of the pumps; it usually contains a strainer.

Punch. An iron implement for backing out a bolt, or for making apertures in metal.

Punishment. No punishment can be legally inflicted except by the commanding officer, or by the sentence of a summary or general court-martial.

Commanding officers are authorized to inflict the punishments of extra duties, deprivation of liberty, reduction of rating, and confinement with or without irons, either on full or reduced rations. The confinement must not exceed ten days. Flogging, gagging, and confinement in coal-bunker or sweat-box are forbidden, and no punishment not specially authorized by the regulations is tolerated. See COURT-MARTIAL.

Punk. The interior of an excrescence on the oak-tree; used as tinder, and better known as touch-wood.

Punt. An Anglo-Saxon term still in use for a flat-bottomed boat, used by fishermen, or for ballast lumps, etc.

Puoys. Spiked poles used in propelling barges.

Puppet-valve. See POPPET-VALVE.

Purchase. Any mechanical advantage which increases the force applied. See TACKLES.

PURCHASE-BLOCKS. All blocks virtually deserve this name, but it is distinctively given to those used in moving heavy weights.

PURCHASE-FALLS. The rope rove through purchase-blocks.

Purging-cock. A cock or valve in the lowest

part of a steam-boiler for the purpose of draining the boiler.

Purre. A name for the dunlin (*Tringa alpina*).

Purse-crab (*Birgus*). A genus of *Crustacea* of the order *Decapoda* and suborder *Anomoura.* It is allied to the Hermit Crab (which see), but has the abdomen or *tail* shorter and almost orbicular, its under surface soft and membranous, its upper surface covered with strong plates, overlapping, as in lobsters. The first pair of legs have large and powerful pincers, the pair nearest the abdomen are very small, but terminate in rudimentary pincers; the pair next to them are larger with small pincers; the second and third pairs of legs are terminated by a single nail.

Purse-net. A peculiar landing-net in fishing. It is used in the seine and trawl to bewilder the fish, and prevent their swimming out when fairly inside.

Purser. Falconer, in his Marine Dictionary, says, "A purser is an officer appointed by the Lords of the Admiralty to take charge of the provisions of a ship of war, and to see that they are carefully distributed to the officers and crew according to the instructions which he has received from the Commissioners of the Navy for that purpose."

Totten defines a purser in the U. S. navy as "a commissioned officer who has charge of the provisions, clothing, etc., and of the public moneys on board ship."

Sir Wm. Monson, about 1600, says, "The purser is in the nature of a cape-merchant in a ship of merchandise, that keeps an account of all things brought into the ship; he ought to be an able clerk." "Likewise if, during the voyage, any of the men happen to die or run away, or for good cause be discharged by the captain's order, to enter likewise the particular day of the month against each of their names in a margent of the books," etc.

The title was derived from *bursar*, the old name for a treasurer or cash-keeper; hence *disburser*, one who pays out money. The term *burse magister* existed in the English merchant marine in the time of Henry VI. The title remained in the U. S. navy from its organization until 1860. By a general order (1847), legalized by act of Congress, 1854, pursers of more than 12 years were to rank with commanders, and of less than 12 years with lieutenants, and to take rank with surgeons according to date of commission. In 1860 it was enacted "that pursers in the navy of the United States shall be hereafter styled 'paymasters.'" Why the old time-honored title was discontinued for a longer one, expressive of only a portion of this officer's duties, it is difficult to imagine. See PAY CORPS.

PURSER'S DIP. The smallest dip-candle.

PURSER'S GRINS. Sneers.

PURSER'S NAME. An assumed name.

PURSER'S POUND (*Eng.*). The weight formerly used in the navy, by which the purser retained an eighth for waste, and the men received only seven-eighths of what was supplied by government. One of the complaints of the mutiny was, having the purser's instead of an honest pound. This allowance was reduced to one-tenth.

PURSER'S SHIRT. *Like a purser's shirt on a hand-spike*, a comparison for clothes fitting loosely.

Purviance, Hugh Y., Commodore U.S.N. Born in Maryland. Appointed from Maryland, November 3, 1818; frigate "Congress," 1819–21, and "Franklin," 74, 1821–24, Pacific Squadron; "North Carolina," 74, Mediterranean Squadron, 1824–27.

Commissioned as lieutenant, March 3, 1827; sloop "Falmouth," West India Squadron, 1828–30; sloop "Peacock," East India Squadron, 1833–34; rendezvous, Baltimore, 1836–37; Brazil Squadron, 1837–38, commanding brig "Dolphin" and sloop "Fairfield"; relieved an American schooner from the French blockade at Salado, River Platte; rendezvous, Baltimore, 1839–40; "Brandywine," Mediterranean Squadron, 1841–42; rendezvous, Baltimore, 1843; commanding brig "Pioneer," coast of Africa, 1843; frigate "Constitution," Mexican blockade, 1846.

Commissioned as commander, March 7, 1849; receiving-ship "Consort," Baltimore, 1850–51; commanding sloop "Marion," coast of Africa, 1852–55.

Commissioned as captain, January 28, 1856; commanded frigate "St. Lawrence" on the blockade off Charleston and Southern coast, 1861; sunk the Confederate privateer "Petrel" off Charleston when just 12 hours out; captured several prizes; participated in the fight of the "Merrimac," gunboats, and batteries off Sewell's Point, Hampton Roads.

Commissioned as commodore, July 16, 1862; light-house inspector, 1863–65. Received a vote of thanks of Maryland Legislature. Retired December 21, 1861.

Push. To crowd all sail. To run the engines to their utmost capacity.

Put. *To put back*, to return to the point of departure. *To put about*, to go on the other tack. *To put to sea*, to quit a port or roadstead and go to sea.

Pyrosomidæ. A family of tunicated marine mollusks. They swim freely, many individuals being usually combined into a nearly cylindrical mass by means of their elastic integument, or *tunic.* They abound in warm seas, and are brightly luminous.

Pyroxylin. See EXPLOSIVES.

Q.

Q. In the log-book, *q* denotes *squalls*.

Quade. An old word for baffling ; as, a *quade* wind.

Quadrant. A quadrant (Lat. *quadrans*, a fourth part) is a reflecting astronomical instrument on the same principle as the sextant (see SEXTANT), but with a shorter arc, so that angles up to 90° only can be measured. If named on the same principle as the sextant it would be called an octant (Lat. *octans*, one-eighth), and this name has been given to the metal-framed quadrants made of late years. Quadrants have generally a wooden frame with an inlaid ivory arc, and were formerly made much larger than at present. The arc is generally divided to half-minutes only. See GUNNER'S QUADRANT.

Quadrature. The moon is in *quadrature* when she is 90° from the sun.

Quagmire. A marsh in which the water remains stagnant.

Quaker. A false or wooden gun.

Quamash, or Biscuit-root. A plant of the natural order *Liliaceæ*. The roasted bulbs are used as an article of food.

Quamino. A negro.

Quarantine (Ital. *quarantina ;* L. Lat. *quarentena ;* Fr. *quarantaine ;* Span. *cuarantena*). The Cyclopædia of Commerce defines quarantine to be the " interdiction of communication to which a ship is subject for a definite period, for fear of her bringing infectious diseases."

Webster defines the word as follows: "1. A space of 40 days. 2. Specifically, the term, originally of 40 days, but now of undetermined length, during which a ship, arriving in port, and suspected of being infected with a malignant, contagious disease, is obliged to forbear all intercourse with the shore ; hence, restraint or inhibition of intercourse to which a ship is subjected, on the presumption that she may be infected. 3 (*law*). The period of 40 days, during which the widow has the privilege of remaining in the mansion-house of which her husband died seized." "Quarantine (*verb*). To prohibit from intercourse with the shore ; to compel to remain at a distance, as a ship from shore when suspected of having contagious disease."

Falconer, in his dictionary, says, " Quarantine, the state of the persons who are restrained within the limits of a ship or lazaretto, or otherwise prevented from having a free communication with the inhabitants of any country till the expiration of an appointed time, during which they are repeatedly examined in regard to their health. It is chiefly intended to prevent the importation of the plague."

The term quarantine is now employed not only for the detention of persons, effects, and merchandise coming by sea, but also for such detention at international or state lines, or at a *cordon* arbitrarily drawn within a state. There is also a quarantine of observation imposed upon vessels that have, for any cause, communicated at sea with another from an infected port, or have been boarded by men-of-war of a hostile nation.

The original period of 40 days, or 6 weeks, imposed in early times, is supposed by some to have had a connection with the penitential period of lent; by others, that it was presumed that 6 weeks was the term or limitation in which any infectious disorder must certainly show itself. However this may be, the term is, and has long been established, in the senses given above, in the language of every sea-faring or mercantile nation.

In some countries vessels from the Levant, Barbary States, Havana, or Vera Cruz, have always to undergo some days' quarantine of observation, even when coming with clean bill of health. But modern experience has shown that some of the pestilential maladies, so called, are not contagious; and quarantine of *persons* has a constant tendency to become less severe, in northern climates especially; and a mere routine prohibition, like that just referred to, must eventually give way to more reasonable, liberal, and well-founded methods.

In 1852 a sanitary convention was held, most of the European states sending delegates, which body recognized the right of any country or countries to isolate another which was infected with plague, yellow fever, or cholera, either by sanitary cordon or by subjection to quarantine. By agreement two kinds of bills of health were recognized: one attesting the presence of disease in the country whence the vessel sailed, and the other attesting the absence of the malady. But vessels in bad sanitary condition, even if bearing the first-mentioned bill of health, were to be detained for purification whenever the authorities of the port at which she arrived deemed it necessary. The minimum of detention was agreed upon as follows: for vessels from countries suspected of plague, 10 full days ; 3 to 6 days for yellow fever, and 3 to 5 days for cholera. These terms are practically often exceeded, at the discretion of the health officers, especially in southern Europe. By the convention, merchandise was divided into 3 classes: 1st. That which is always quarantined and purified. 2d. That subject to detention and purification after examination and decision by experts. 3d. Those articles always exempt. Ships were to pay a health due according to tonnage ; and, while in quarantine, to pay a fixed daily rate, as must, also, persons placed in quarantine. Merchandise placed on shore at a lazaretto was to pay a special tax, by weight or valuation.

England refused to agree to this convention, and took the responsibility of practically doing away with quarantine in her ports for plague, yellow fever, and cholera, except under unusual

circumstances, when the power to enact quarantine lies in the crown, by an order in council. The orders in council in regard to yellow fever were revoked in 1869.

Although this is done there with impunity, at least as to the two first diseases, the wisdom of spasmodic action in regard to cholera may well be doubted. It would be impossible for countries situated in a lower latitude to follow her example. Nowhere, however, is quarantine more strictly enforced than in the British ports of Gibraltar and Malta; and the reason is that any attempt of the English government to alter the quarantine regulations of the Mediterranean colonies, without the sanction of the neighboring countries, would produce greater inconvenience than that arising from the present system. The *pratique* granted in those colonies would not then be recognized in the neighboring countries, and all vessels from Malta or Gibraltar would be subjected by them to a quarantine of observation.

In torrid countries, where yellow fever and cholera are endemic, quarantine is, of course, of little use, while in lat. 50° N. there is no fear of yellow fever. Large discretion must, however, in all cases and in all countries, be invested in the officers of health.

In 1865 another sanitary convention met at Constantinople, principally to deliberate in regard to cholera. This body again fully recognized the necessity of restrictive measures, while the importance of striking at the sources of epidemics in the places of their origin was duly set forth.

The importance of quarantine has been recognized from the earliest periods, although for ages it only consisted in the isolation of lepers. In the Middle Ages it was chiefly enforced against the plague, which had been the scourge of the Old World for so many centuries. We learn from history that the plague once prevailed at Athens, more or less severely, for 50 years. Hippocrates and Thucydides give accounts of it as far back as 330 B.C. The disease raged throughout the Roman empire from 250 to 265 of our era, and for some time 5000 persons died in Rome every day. When the plague appeared in Alexandria, A.D. 542, more than half the population was carried off. More modern instances of its dreadful ravages in Europe, Asia, and Africa are quite familiar, and it still prevails almost every year at Bagdad, and other places upon the Tigris and Euphrates.

In later days, in addition to plague, yellow fever, cholera, and typhus have been the diseases principally combated by quarantine, and for this purpose lazarettoes have been long in use. *Lazaretto* is derived from Lazarus, the patron saint of lepers. It may be defined as an isolated establishment, generally walled, on or near a port, built and arranged to receive the sick and those suspected of contagion, as well as merchandise. Lazarettoes are most common on the routes of commerce and travel on the shores of the Mediterranean. They often have extensive courts and gardens for air and exercise for those detained there, as well as appliances for disinfecting men, their clothing, and goods. The lazarettoes of Genoa, Leghorn, and Marseilles are so large and well arranged that ships need not necessarily be detained there, but may unload their cargoes in bond. Important papers, and money or letters necessary to be transmitted through quarantine, are still, in many cases, punctured, fumigated, or even immersed in weak acids before being allowed to circulate.

Although lazarettoes are of considerable antiquity, they were not established until, in the Middle Ages, the plague had repeatedly swept the great commercial cities of the Mediterranean, whence it spread to those of the interior with deplorable results, more than decimating many of them. At last the idea of protection was forced upon them, and Venice, as the queen of commerce, naturally took the lead. It has been said by some writers that there are traces in her records of some attempt at health regulations about 1130, and she certainly set the example of strict inspection of arriving vessels in 1318, while in 1403 the practice of isolation was introduced, the island of St. Mary of Nazareth being set apart for that purpose. Inspection of vessels was practiced at Reggio, in the Straits of Messina, almost at the same time as at Venice. Some accounts, indeed, state that Reggio preceded her. Count Barnabo, finding that those who avoided the sick generally escaped the plague, established a rough kind of quarantine, which consisted in placing those sick of the disease, found in vessels passing through the straits, in an open field, to die or to recover, and the persons engaged in handling the patients were excluded from communication with the population. In Florence the state took precautions against the spread of epidemics as early as 1348. In 1453 there was a lazaretto in Sardinia. In 1448 Venice had already a digest of quarantine laws, and in 1485 a regular health commission was established and the purification of cargoes begun.

The action of Venice, the centre of commerce, went far towards preventing the wholesale mortality which threatened to depopulate much of Europe, as the pest, once introduced, was fostered by the filthy and unwholesome mode of living then prevalent among all classes.

Genoa, always a rival of Venice, speedily followed her example as to quarantine, while at Marseilles, the third great commercial city of the Mediterranean, the first measures in this direction date from the plague of 1476.

These well-intended efforts were not always successful, for, in Marseilles, in 1656, it was not possible to bury the dead from plague, and they were obliged to be burnt, as has often happened elsewhere in sweeping epidemics. Marseilles, indeed, suffered from no less than 14 visitations of plague between 1505 and 1650. From the latter year, when more thorough precautions were taken, and a new lazaretto constructed, to 1720, she escaped entirely; and it has never again reached the city, although it has prevailed in the lazaretto twenty times, the last occasion being in the year 1825.

The annoying precautions necessary, and the time consumed by quarantine, have always varied with the locality, and the port from which the suspected or infected vessel came; and the severity of the rules, and the stringency with which they were insisted upon and carried out, have always excited the complaint of merchants and travelers. But as education and general intelligence extend, there is less and less disposition to question rules which commend themselves to every reasoning mind; and business in-

terests and sanitary requirements are now much more in accord. In all places it is a high misdemeanor to evade or break quarantine, and there appears less disposition to do this at the present day than formerly existed. McCulloch, in his Dictionary of Commerce, says, "In some cases, perhaps, quarantine regulations have been carried to a needless extent; but they have more frequently, we believe, been improperly relaxed."

As an instance of protection afforded by quarantine we may adduce the terrible scourge of yellow fever in Barcelona, in 1821, which was transmitted by sea, thence reached Marseilles, but was excluded from that city by rigorous quarantine. The instances of a like nature in our own country, both North and South, are too numerous to mention, especially in the epidemics of yellow fever in recent times.

Sanitary cordons, connected with the stamping out of foci of disease, have recently been eminently successful in preventing the spread of plague in Southern Russia, and of yellow fever in our Southwestern States.

A ship sailing from a port to one in another country is furnished by the consul of the country to which she belongs, or by the local authorities, with a bill of health, which shows the sanitary condition of the place of departure. If good, it is called a *clean* bill of health; and if, on the contrary, epidemic or contagious disease prevails, it is called a *foul* one. A bill from a suspected port is sometimes called a *touched* one.

The nature of the bill of health, and the declaration of the master of the vessel, regulate the length of quarantine, if any is required. It is not obligatory upon a master to take a bill of health, but the absence of one renders the vessel a suspected one in her port of arrival.

Pilots are everywhere required to make inquiry in regard to the port of departure and state of health of vessels which they may board, and are required to anchor them in proper place, accordingly, under heavy penalties. Fine and imprisonment are the usual penalties for gross invasion of quarantine law; and in France, under certain circumstances, the punishment may be death.

In the case of a man-of-war sailing from a port, the bill of health is usually furnished gratis by the authorities; and the declaration of the commander and of the medical officer is usually received as regards the state of health upon arrival.

Much the same precautions are taken with regard to the cattle plague as with merchandise and passengers, except that, in many instances, the animals are required to be killed at once, and always are sacrificed when symptoms of disease are shown.

In this country all vessels arriving from foreign ports, at any season of the year, must be boarded and examined by the officers of health, and coasting vessels come under the same category, according to the season of the year and the geographical position of the ports from which they come.

When a vessel and her passengers have leave to communicate freely with the shore, either directly upon arrival, or after having gone through a term of quarantine, she is said to have received *pratique.* This is derived from the Italian *pratica.* In the case of infected or suspected vessels, the crew and passengers, and their effects, are purified in the lazaretto or on board, and the hold of the vessel herself, and all cargoes of cotton, hemp, rags, paper, hides, skins, feathers, hair, and wool, are especially the objects of disinfection, while metals, lumber, sugar, live-stock, and other cargoes are treated as the discretion of the health officers may direct. In the Mediterranean all live animals, except horses, are supposed to be ready conveyors of plague, and cats more so than any others, as in Eastern countries they form part of households, which dogs do not.

On this continent the first quarantine law was enacted in the Province of Pennsylvania, in reference to yellow fever, in the year 1700. The quarantine station, still bearing the name of "Lazaretto," exists in the place in which it was originally established, a few miles below Philadelphia, and depuration of passengers and cargoes is still performed there.

The present condition of quarantine in the different States of the Union leaves much to be desired, as the States have different and sometimes conflicting laws. All provide some sort of quarantine for contagious and infectious diseases, but the practice in carrying out the necessary precautions is not uniform, and in many cases inefficient.

In 1804, Mr. Jefferson protested against the passage of a general law regulating quarantine, as an interference with States' rights; and each State has continued to have its own code, some very good, and others harassing and contradictory. A national quarantine law was proposed in 1872, but only passed one house of Congress. There is no doubt, however, that the passage of such an act is only a question of time.

The National Board of Health is now doing excellent service, not only in practical work, but in educating the people to a proper appreciation of the necessity of a general quarantine law. The following is the act of Congress establishing the National Board:

"AN ACT *to prevent the introduction of infectious or contagious diseases into the United States, and to establish a National Board of Health.*

"*Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled,* That there shall be established a National Board of Health to consist of seven members, to be appointed by the President, by and with the advice and consent of the Senate, not more than one of whom shall be appointed from any one State, whose compensation, during the time when actually engaged in the performance of their duties under this act, shall be ten dollars per diem each and reasonable expenses, and of one medical officer of the army, one medical officer of the navy, one medical officer of the Marine Hospital Service, and one officer from the Department of Justice, to be detailed by the Secretaries of the several Departments and the Attorney-General respectively, and the officers so detailed shall receive no compensation. Said board shall meet in Washington within thirty days after the passage of this act, and in Washington or elsewhere from time to time upon notice from the president of the board, who is to be chosen by the members thereof, or upon its own adjournments, and shall frame all rules and regulations authorized or required by this act,

and shall make or cause to be made such special examinations and investigations at any place or places within the United States, or at foreign ports, as they may deem best to aid in the execution of this act and the promotion of its objects.

"SEC. 2. The duties of the National Board of Health shall be to obtain information upon all matters affecting the public health, to advise the several Departments of the government, the executives of the several States, and the commissioners of the District of Columbia on all questions submitted by them, or whenever, in the opinion of the board, such advice may tend to the preservation and improvement of the public health.

"SEC. 3. That the Board of Health, with the assistance of the Academy of Science, which is hereby requested and directed to co-operate with them for that purpose, shall report to Congress at its next session a full statement of its transactions, together with a plan for a national public health organization, which plan shall be prepared after consultation with the principal sanitary organizations and the sanitarians of the several States of the United States, special attention being given to the subject of quarantine, both maritime and inland, and especially as to regulations which should be established between State or local systems of quarantine and a national quarantine system.

"SEC. 4. The sum of $50,000, or so much thereof as may be necessary, is hereby appropriated to pay the salaries and expenses of said Board and carry out the purposes of this act.

"Approved March 3, 1879."

This act was supplemented by another, approved June 2, 1879, entitled "An act to prevent the introduction of contagious or infectious diseases into the United States."

This act provides for the co-operation of the National board with the State boards; and where there are no local boards, or their regulations and means of prevention are not sufficient, as is often the case, they are to be assisted by proper persons, to be detailed by the President; and if they shall fail or refuse to enforce proper rules and regulations, the President may detail proper persons to do so.

Rules and regulations shall be made by the National board by which information can be obtained of the sanitary condition of foreign ports from which contagious or infectious diseases are or may be imported into the United States. Consuls are obliged to make constant sanitary reports of the condition of such ports; and medical officers may be detailed for residence at such ports, for the purpose of giving advice and assistance, and for seeing that vessels sailing for the United States are put in good sanitary condition. Domestic reports are also obtained from all parts of the country, by which any tendency to the development of epidemics is at once detected. The sum of $500,000 provided by this act is to be disbursed under the direction of the Secretary of the Treasury, upon estimates made by the board, and the appropriation is considered continuous. Local sanitation, except in rare cases (where disinfectants and money to pay sanitary inspectors and police have been provided), is not one of the duties of the board, as no attainable appropriation would be sufficient to serve such a purpose.

This law was hardly promulgated when the board found itself confronted by an alarming outbreak of yellow fever in Memphis, as well as the occurrence of some threatening cases in New Orleans. The disease also appeared in some other localities, and the highest legal authorities recognized the obvious duty of the board to be the assistance of the local authorities in the stricken communities in their efforts to stamp out the disease and prevent its spread to other States. By the measures recommended by the board, and the pecuniary aid extended to enable the authorities to carry out the recommendations, the spread of the disease was actually restrained within narrow limits. Measures were also advised as to precautionary work during the succeeding winter, which proved so successful that a very hot summer has just passed without the occurrence of a single case of yellow fever in Memphis. This result is most encouraging. Space does not permit a reference to other functions of the National Board of Health; but we may say that the constant reports of experts received by it, with the publication of essays on drainage, ventilation, and cognate subjects, as well as the collection of statistics on a grand scale, have laid the foundation for a wise and scientific treatment of the whole subject of quarantine and national hygiene.

Another international conference upon quarantine is to be held at Washington in January, 1881.—*E. Shippen.*

QUARANTINE-FLAG. A yellow flag hoisted in a conspicuous place to indicate the presence of contagious disease. It is hoisted at the fore of vessels undergoing quarantine, and is familiarly termed *yellow-jack.*

Quarry. The prey taken by whalers,—a term borrowed from falconers.

Quarter. The part of a yard just outside the slings. The upper part of the topsides at the after end of a ship. *On the quarter*, the position of an object 45° abaft the beam.

QUARTER-BADGE. An artificial gallery; a carved ornament near the stern of those vessels which have no quarter-galleries.

QUARTER-BLOCKS. Blocks under the quarters of the yards, to act as leaders for the sheets and clewlines.

QUARTER-BOAT. Any boat is thus designated which is hung to davits over the ship's quarter; it is used as a life-boat.

QUARTER-DAVITS. Pieces of iron or timber with sheaves or blocks at their outer ends, projecting from a vessel's quarters, to hoist boats up to.

QUARTER-DECK. The upper deck abaft the mainmast. Naval etiquette requires all persons to salute on coming on the quarter-deck, and to conduct themselves in a decorous manner while thereon. The starboard side in port and the weather side at sea are reserved for the use of the commanding and executive-officers, and the officer of the deck.

QUARTER-DECKERS. Officers more conspicuous for their observance of etiquette than for their knowledge of the requirements of their profession.

QUARTER-DECKISH. Punctilious; severe.

QUARTER-FAST. See FAST.

QUARTER-GALLERIES. Projections from the quarters which are intended to ornament and make a finish to the quarters, as well as to be useful; they are only fitted on vessels of war.

QUARTERING. Wind blowing from a point about 45° abaft the beam.

QUARTER-TACKLE. A tackle hooked to the quarter of one of the lower yards, and used with the yard-tackle in hoisting heavy articles out or in. It has been superseded by the stay-tackle.

Quarter-galley. A Barbary cruiser.

Quarter-gunner. See GUNNER.

Quarter-hung. A gun is *quarter-hung* when the axis of the trunnions is below the axis of the bore.

Quarterly Returns. Returns of stores on hand at the end of the quarter, with the receipts and expenditures during the quarter.

QUARTER-MASTER. A petty officer who assists the navigator in the minor details of his various duties. The quarter-masters have charge of the log, leads, lights, colors, signal-apparatus, compasses, helm, etc., and in action are stationed at the conn, helm, and relieving-tackles, attend to making and reading signals, and when on soundings heave the lead. They keep regular watch from the beginning of a cruise till a ship goes out of commission. They are always selected from the most experienced and reliable seamen.

Quarters. The stations of officers and men at the guns for battle, for exercise, or for inspection. The stations for battle or for exercise, as though engaged in battle, are distinguished as *general quarters*. The apartment allotted to a person or mess.

QUARTER-BILL. A bill giving the stations of officers and men in actions.

Quarter-watch. A division of one-fourth part of the ship's company. In the days when a ship carried a large number of men, a quarter-watch was sufficient to handle her in pleasant weather.

Quashee. The familiar designation of a West India negro.

Quator Maria. The four seas which surround Great Britain; the British Seas.

Quay. An artificial bank or wharf, at the side of a harbor or stream, at which vessels receive and discharge cargo.

QUAYAGE. Wharfage.

QUAY-BERTH. A loading or discharging berth for a ship in a public dock.

Quebec, the second city of Canada, is situated on the left bank of the St. Lawrence River (which is here joined by the St. Charles), in lat. 46° 49′ 6″ N., and lon. 71° 13′ 45″ W. Shipbuilding is the principal industry. There are also manufactures of iron castings, machinery, cutlery, nails, leather, musical instruments, rope, etc. The principal export is lumber, furnished principally by the forests on the Ottawa and St. Maurice Rivers, and down these rivers it is rafted to the St. Lawrence, and the rafts sometimes extend for 6 miles along this river at Quebec. Pop. 55,000.

Quebranta Huesos (*Sp.*). Literally, *bone-breaker.* A name for the great petrel, *Procellaria gigantea.*

Queche. A small Portuguese smack.

Queen's Parade (*Eng.*). The quarter-deck.

Queenstown, Cork County, Ireland, is situated on the south side of Great Island, in Cork harbor. It is well protected by batteries, and on the islands opposite are additional fortifications, magazines, etc. American steamers bound for Liverpool usually call at Queenstown. Pop. 11,000.

Queriman. A mullet of Guiana, found in turbid waters.

Querquedule. A light vessel; a boat. Also, a sea-fish.

Quicken. In ship-building, to give anything a greater curve.

Quick Firing. See FIRING.

Quick-match. See MATCH.

Quick-saver. A span formerly used to prevent the courses from bellying too much when off the wind.

Quick-work. All that part of a ship which is under water when she is laden; it is also applied to that part of the inner upper-works of a ship above the covering-board. Also, the short planks worked inside between the ports. In ship-building the term strictly applies to that part of a vessel's side which is above the chain-wales and decks, as well as to the strakes which shut in between the spirketings and clamps. In general parlance quick-work is synonymous with *spirketing.*

Quietus. A severe blow; a settler.

Quill-tube. See PRIMER.

Quilting. A kind of coating formed of sennit, strands of rope, etc., outside any vessel containing water. Also, the giving a man a beating with a rope's end.

Quink. A name for the golden-eyed duck, *Anas clangula.*

Quinquereme. An ancient vessel with 5 banks of oars. According to Polybius a quinquereme carried 300 seamen and 120 soldiers. See TRIREME.

Quod. Durance; prison.

Quoin. A wedge-shaped wooden implement. Before the introduction of elevating screws, quoins were used in elevating guns. *Chocking-quoins* are used under the trucks of a gun-carriage to prevent its running out or in.

Quota-men (*Eng.*). Men raised for the navy at great expense by Pitt's quota-bill, in 1795. They received bounties of from $100 to $300.

R.

R. Abbreviation for *are* in the U. S. General Service Signal Code. On the ship's books, R denotes *run* when placed against the name of a deserter. In the log-book *r* denotes *rainy*.

Rabanet, or Rabinet. A small, slender piece of ordnance, formerly used for ships' barricades. It had a 1-inch bore, and carried about a ½-pound ball.

Rabatment. The drawing of the real shape of the molding of the pieces in the frames in any required position.

Rabatt, Morocco, is situated on the south side of the Boo Regreb River, at its mouth, immediately opposite Sale. It has strong walls and batteries, a citadel and barracks. It has manufactures of pottery and carpets, an export trade in wool and corn, and considerable traffic. It was formerly the centre of the European trade with Morocco. Pop. 27,000.

Rabbet. A groove in a piece of timber, cut for the purpose of receiving another piece. On the stem, stern-post, and keel of wooden ships it is cut to receive the planking.

Race. When the tidal-wave passing along the coast is arrested in its course, the water, under certain conditions, attains a height which causes it to flow off obliquely; such a current is called a *race*. The canal by which water is conducted to and from a water-wheel.

Race-horse. A duck of the South Seas, thus named, says Cook, for "the great swiftness with which they run on the water."

Racine is situated on the west shore of Lake Michigan, at the mouth of Root River, in Racine County, Wis., and is the second city in the State in commerce and population. It has large grain-elevators, threshing-machine works, woolen-mills, wagon-factories, fanning-mill factories, wire-works, machine-shops, etc. Owing to its extensive manufacturing enterprises, Racine requires great shipping facilities, and these are supplied by three lines of railways. On the lake the West Shore Steamboat Line makes daily trips to Chicago, and the lower lake propellers make regular stops at this port. There are in addition to these quite a number of sailing-vessels owned here. Pop. 18,000.

Racing. A term applied when a marine engine suddenly acquires an abnormally high or irregular speed, caused by the propeller being partially emerged from the water by the action of a heavy sea.

Racing, Laws of Boat- (Adopted by the National Association of Amateur Oarsmen).

1. All boat-races shall be started in the following manner: The starter, on being satisfied that the competitors are ready, shall give the signal to start.

2. If the starter considers the start false, he shall at once recall the boats to their stations, and any boat refusing to start again shall be disqualified.

3. Any boat not at its post at the time specified shall be liable to be disqualified by the umpire.

4. The umpire may act as starter as he thinks fit; where he does not so act, the starter shall be subject to the control of the umpire.

5. Each boat shall keep its own water throughout the race, and any boat departing from its own water will do so at its peril.

6. A boat's own water is its straight course, parallel with those of the other competing boats, from the station assigned to it at the starting to the finish.

7. The umpire shall be sole judge of a boat's own water and proper course during the race.

8. No fouling whatever shall be allowed; the boat committing a foul shall be disqualified.

9. It shall be considered a foul when, after the race has commenced, any competitor, by his oar, boat, or person, comes in contact with the oar, boat, or person of another competitor, unless, in the opinion of the umpire, such contact is so slight as not to influence the race.

10. The umpire may, during a race, caution any competitor, when in danger of committing a foul.

11. The umpire, when appealed to, shall decide all questions as to a foul.

12. A claim of foul must be made to the judge or the umpire by the competitor himself before getting out of his boat.

13. In case of a foul, the umpire shall have the power—*a.* To place the boats (except the boat committing the foul, which is disqualified) in the order in which they come in. *b.* To order the boats engaged in the race, other than the boat committing the foul, to row over again on the same or another day. *c.* To restart the qualified boats from the place where the foul was committed.

14. Every boat shall abide by its accidents.

15. No boat shall be allowed to accompany a competitor for the purpose of directing his course or affording him other assistance. The boat receiving such direction or assistance shall be disqualified at the discretion of the umpire.

16. The jurisdiction of the umpire extends over the race and all matters connected with it, from the time the race is specified to start until its final termination, and his decision in all cases shall be final and without appeal.

17. Any competitor refusing to abide by the decision, or to follow the directions of the umpire, shall be disqualified.

18. Boats shall be started by their sterns, and shall have completed their course when the bows reach the finish.

19. In turning races, each competitor shall have a separate turning-stake, and shall turn from port to starboard. Any competitor may turn any stake other than his own, but does so at his peril.

20. The umpire, if he thinks proper, may reserve his decision, provided that in every case such decision be given on the day of the race.

Rack. To bind two parts of a rope or tackle together with spun-yarn, marline, etc. An iron support for shot at the waterways and around the hatches. A receptacle for the hauling part of the topsail halliards. The upper stratum of clouds. *Rack of the weather*, the direction in which the upper stratum of clouds is passing.

RACK-BAR. A billet of wood used for twisting the bight of a swifter round, in order to bind a raft firmly together.

RACKING. Spun-yarn or other stuff used to rack two parts of a rope together.

RACKING-TURNS. Turns taken alternately over and under the parts of a rope to be bound together.

RACK-RIDER. The name of the samlet in northern fisheries, so called because it generally appears in bad weather.

Rack and Pinion. An arrangement of toothed gearing by which motion is converted from rotative to rectilinear, or from rectilinear to rotative. The rack consists of a straight bar provided with projections or teeth; the pinion is a revolving piece having teeth to match those of the rack, and both parts are provided with suitable bearings or supports. If the pinion is fixed in position, the rack will slide in direction of its length; and if the rack is fixed, the centre of the pinion will move parallel to its face. The velocity-ratio between rectilinear and rotative motion depends upon the ratio between the radius of the pitch-line of the pinion and that of the circumference through which the rotative motion acts.

Rack-block. A range of sheaves cut in one piece of wood.

Raddle. To interlace; as in making boats' gripes and flat gaskets.

Radford, William, Rear-Admiral U.S.N. William Radford was born in Virginia. He was appointed from the State of Missouri, March 1, 1825; attached to Mediterranean Squadron, 1827–28; and to sloop-of-war "Erie," West India Squadron, 1830–31.

Promoted to passed midshipman, June 4, 1831; attached to sloop-of-war "John Adams," Mediterranean Squadron, 1835.

Promoted to lieutenant, February 9, 1837; attached to sloop-of-war "Warren," Pacific Squadron, 1845–47.

Lieut. Radford commanded the party that cut out the "Malokadel," a Mexican vessel of war, at Mazatlan, west coast of Mexico; attached to store-ship "Lexington," 1852–53.

Promoted to commander, September 14, 1855; commanding sloop-of-war "Dacotah," East India Squadron, 1860–61.

Commissioned as captain in 1862; commanding sloop-of-war "Cumberland" in 1861, and was on court-martial duty at Old Point when that ship was attacked by the ram "Merrimac," which had steamed down from Norfolk. Commander Radford made strenuous exertions to reach his ship before the fight was over, but arrived at Newport News just as the "Cumberland" was sinking.

Promoted to commodore, April 24, 1863; commanded frigate "New Ironsides," an ironclad division of Porter's squadron, at the two attacks upon Fort Fisher, in December, 1864, and January, 1865; commandant at Washington Navy-Yard, 1866–68.

Commissioned as rear-admiral in 1868; commanding European Squadron in 1869–70; special duty, Washington, 1871–72. Retired March 1, 1870.

Radiant. The point whence numbers of shooting-stars seem to diverge in star-showers.

Radius-bar, or Radius-rod. A bar or rod restrained to a fixed centre at one end, and guiding a movable body, in an arc, at the other; as, in Watts's parallel-motion.

Radus. A name for the constellation Eridanus.

Raft. A number of logs, planks, etc., firmly bound together. See LIFE-RAFTS.

RAFT-DOG. A flat piece of iron, each end of which is bent at right angles and pointed.

RAFT-PORT. A port cut in a vessel, forward or aft, near the water-line, for convenience in loading or unloading timber; a timber-port.

Rag-bolt. A bolt having its surface roughened by raising sharp prominences by cuts of a chisel, so that it may not be easily withdrawn from the wood into which it is driven.

Rail. The upper part of the bulwarks. Rods and stanchions across the ship at the break of the poop or forecastle. *Rails of the head*, curved pieces of timber extending from the bows on each side to the continuation of the ship's stem, to support the knee of the head.

Rain-cloud. See CLOUD.

Rains. Belts or zones of calms, where heavy rain prevails; they exist between the northeast and southeast trade-winds, changing their latitude several degrees, depending on the sun's declination. In India "the rains" come in with the southwest monsoon.

Raise. To increase the apparent elevation of an object by approaching it. A vessel is *raised upon* when she is heightened in her upper works. *To raise the wind*, to procure funds. *To raise a mouse*, to make a mouse on a stay. (See MOUSE.) The prize-fighters have adopted this expression, and mean by it to raise a lump on the face of the opponent.

RAISE-NET. A kind of staked net, so called from rising and falling with the tide.

Rake. The overhang of the stern, stem, or masts of a ship beyond a perpendicular with the keel. To fire at a ship from such a position, ahead or astern, that the projectiles range fore and aft the ship, sweeping the decks.

RAKING-FIRE. See FIRE.

RAKISH. Having a saucy appearance indicative of speed and dash.

Raleigh, Sir Walter, was born in 1552, at Hayes, County of Devonshire, England. In 1568 he was sent to Oxford as a commoner of Oriel College, but only remained there one year, going to France as a volunteer in an expedition in aid of the Huguenots. Some years later we find him serving in the Low Countries with the English force sent by Queen Elizabeth to assist the Dutch in their struggle against the Spaniards. Participating in the desire of his half-brother, Sir Humphrey Gilbert, to establish a colony on the eastern coast of America, this remarkable man accompanied the unfortunate expedition in 1579, but happily escaped Gilbert's fate and returned home. Fired with the idea of creating a

great colonial empire which should make England the equal of Spain, Walter Raleigh obtained a patent from Queen Elizabeth for the discovery and settlement of parts of the great transatlantic shore, and on the strength of this power he dispatched 2 vessels under Amades and Barlow, to proceed to the coast of Florida. The result was the possession and occupation of the territory called, in compliment to the maiden queen, Virginia. This occurred in 1585–86. Ten years later Raleigh obtained the means of proceeding to what he believed to be a land of gold,—El Dorado, in fanciful phrase,—but in reality the shore of the northeastern part of South America. He reached Guiana, and proclaimed it the property of England. Leaving his ships at the mouth of the Orinoco, he sailed 400 miles up the river, and succeeded in gaining the good will of the Indians. But beyond the honor of the geographical discovery Raleigh reaped no advantage from his voyage to Guiana, nor was the queen or her successor, James I., disposed to ratify the enterprise by formally colonizing Guiana. On his return home he fell into disfavor with James I., and for an imputed offense suffered 12 years' imprisonment in the Tower of London. After his release the king, to gratify his own cupidity, sanctioned a second voyage to Guiana. Its unproductiveness revived the animosity which had contributed to his long imprisonment, and being put upon his trial on new charges, he was sentenced to be beheaded, and on the morning of the 29th of October, 1618, in the 66th year of his age, he was executed.

Ram. A long spar, iron-hooped at the end, used for driving out blocks from beneath a vessel's keel, and for driving planks an-end while only wedged to the ship's side. *To ram*, to force home the charge of a gun. To run bows-on into another vessel. See Marine Rams.

Rammer. A staff with a cylindrical head, used in loading to press home the charge of a gun.

Rambade. The elevated platform built across the prow of a galley, for boarding, etc.

Ram-block. An old name for a dead-eye.

Ramed. Said of a ship upon the stocks when the frames, stem, and stern-post are adjusted from the use of the ram-line.

Ram-head. An old name for a halliard-block.

Ram-line. A small line which was used in old times for the purpose of determining the centre-line of a ship, and also for running sheer-lines when long battens were not attainable.

Ramper-eel. A name of the lamprey, *Petromyzon marinus.*

Ram-reel. Synonymous with *stag-dance.*

Ramsgate, Kent County, England, is situated on the east coast of the Isle of Thanet. Its artificial haven, formed by two stone piers projecting from 1500 to 2000 feet into the sea, incloses an inner basin, and is bordered by wet- and dry-docks. It is a member of the Cinque Port of Sandwich, and has quite a coasting-trade, fisheries, and imports of provisions from the Netherlands and France. Pop. 14,700.

Ran. Yarns coiled on a spun-yarn winch.

Rance. The strut or support of a Congreve-rocket.

Randan. A mode of rowing with alternate long and short oars.

Random Shot, or Random Range. A shot made when the muzzle is highly elevated; the utmost range may be at an angle of 45°, which is supposed to be about ten times as great as the point-blank, but improved gunnery has now put the term out of use.

Range. The straight line joining two prominent objects. The distance from the muzzle of a gun to the point at which the projectile first strikes. (See Point-blank.) *To range*, to sail parallel with and near to; as, *to range the coast, to range alongside*, etc. *Range of cable*, a certain quantity of slack cable hauled up out of the locker and ranged along the deck, to decrease the strain brought on the cable and bitts when the anchor is let go.

Range-heads. The windlass-bitts.

Rangoon, the capital of British Burmah and of Rangoon district, India, is situated on the east arm of the Irrawaddy, in lat. 16° 46′ N., lon. 96° 17′ E. It has a great trade in rice, cotton, petroleum, and teak timber. It is accessible to large ships, and also has an immense river traffic. Pop. 99,000.

Rank. A step or degree in a graduated scale of authority. In this sense it is synonymous with *grade*, but the conventional use of the two words *rank* and *grade* among naval and military men implies a distinction between them which is illustrated by saying that while there may be several individuals of the same grade, there can be but one of a given rank. In this narrow and conventional sense, therefore, rank may be defined as the expression of relative authority between individuals of the same grade. As an example of what is meant by this, the Navy Register contains the names of 50 officers in the *grade* of captain, but of all this number no two are of the same *rank.*

Actual rank is that held by an officer in his own corps. *Relative rank* is that given by law to officers acting as chiefs of bureaus, in cases where their actual rank is lower than that fixed by law as appropriate to the position, and to all staff officers, in order to assimilate their respective grades to those grades of the line which are deemed equivalent in dignity and importance. Relative rank, as between officers of the army and navy, is established by law, and is sometimes called *assimilated* rank.

Brevet rank does not exist in the navy, but in the army means rank in the army at large, and is conferred for gallant actions or meritorious services.

In another sense *rank* means a line or row of soldiers reckoning from side to side; *the ranks*, the body of common soldiers; *rank and file*, the general mass of enlisted men, privates and non-commissioned officers, excepting the non-commissioned staff. To *rank*, or to *take rank of*, is to be entitled to, or to have, precedence in matters involving the exercise of authority, or on occasions of ceremony.

Rank, Insignia of. Distinguishing marks established by law to be worn by officers of the army and navy, to indicate the grade of the wearer. In the navy the grade of officers is indicated by devices in the epaulet, shoulder-knot or strap, and by stripes of gold lace on the cuffs of the coat. See Uniform.

Ransom. To redeem from captivity, punishment, or forfeit by paying an equivalent; to buy

out of servitude or penalty; to rescue; to deliver; as, to ransom prisoners from an enemy. *Ransom bill*, a war contract, protected by good faith and the law of nations, by which the captor permits the original owner of captured property to redeem it.

Ransom, George M., Commodore U.S.N. Appointed from Ohio, July 25, 1839.

Promoted to passed midshipman, July 2, 1845; master, June 28, 1853; lieutenant, February 21, 1854; lieutenant-commander, July 16, 1862; commander, January 2, 1863; captain, March 2, 1870; commodore, March 28, 1877.

Served as midshipman in the "Marion," coast of Brazil, 1839–42; and in the "Erie," Pacific Squadron, 1843–44; Naval School, Philadelphia, 1845.

As passed midshipman at the Naval Observatory, Washington, 1845–46; seven months in the war on the coast of Mexico, 1847; Naval Observatory, 1847–48; in the "Portsmouth," coast of Africa, 1848–50; in the "Relief," 1851–52.

As master in the "Michigan," on the lakes, 1853–55.

As lieutenant in the "Perry," "Dolphin," and "Jamestown," coast of Africa, 1855–57; ordnance duty at Boston, 1857–59; in the "Narragansett" and "Saranac," 1860–61, on the Pacific Station.

As lieutenant-commander, commanded the "Kineo," of Farragut's fleet, in the Mississippi River, 1862–63.

As commander, commanded the "Mercedita," on special service in the West Indies, from April to August 24, 1863; the "Grand Gulf," North Atlantic Blockade, 1863–64; the "Muscoota," 1863, having a general supervision, by appointment, of blockading vessels in the East Gulf Squadron; the "Algonquin," from January 18 to March 21, 1866, in a trial with the "Winooski" in Long Island Sound; at League Island, Pa., as executive, 1867–69.

As captain, commanded the ironclad "Terror," North Atlantic Fleet, 1870; at the New York Navy-Yard as executive, 1871–73; commanded the frigate "Colorado," North Atlantic Fleet, 1873–75; and the frigate "Franklin," from December 9, 1876, to March 2, 1877, on special service.

As commodore, commanded the Naval Station at Port Royal, S. C., from June 3, 1878, to January 14, 1879, and since then in command of the navy-yard and station at Boston, Mass.

Rape-oil. A thick yellow oil expressed from rape-seed, used in lamps and light-houses.

Raper. An old term for a rope-maker.

Rap-full. A term applied to the sails of a ship close-hauled, when every cloth draws.

Rapparee. A smuggler, or one who lives on forced hospitality.

Ras Algethi. The star *a Herculis*.

Ras Alhague. The star *a Ophiuchi*, nearly on the line from Antares to Vega, and 12° north of the equinoctial.

Rasee. See RAZEE.

Rasing-iron. An implement used in clearing a seam of pitch and oakum.

Rasp. A species of file on which the cutting prominences are distinct, being raised by punching with a point instead of cutting with a chisel.

Ratcher. An old term for a rock.

Ratchet. A bar, or a revolving cylinder or disk, having angular teeth or notches cut upon its surface or edge, into which a pawl or catch drops, to prevent backward motion of a resistance to be overcome, during a temporary cessation of the moving force; also, an arrangement by which a rectilinear or rotative motion in one direction is, by means of a pawl attached to an oscillating lever or handle, communicated to a sliding bar or rotating disk.

RATCHET DRILL-BRACE. A drill-brace by which a drill is rotated by means of a ratchet, consisting mainly of an oscillating handle or lever provided with a spring pawl acting upon a notched ring or disk fitted to the drill-socket. The drill is "fed" to its work by means of a screw in the end of the socket bearing against an adjustable standard.

RACHET-SABOT. See ORDNANCE.

Rate. The class to which a man-of-war belongs by reason of her tonnage and armament. (See CLASSIFICATION.) In all navies the rates change as improvements are made in ordnance and construction. Thus, in the British navy, at one time, the first-rates comprehended all ships of 110 guns and upwards; they had 42-pounders on the lower deck, the calibre diminishing on the upper decks, to 6-pounders on the quarter-deck and forecastle; they carried from 750 to 900 men. Second-rates mounted 90 to 110 guns. Third-rates, 80 to 90. Fourth-rates, 60 to 80,—comprehended under the general term "frigates" and never appearing in the line of battle. Fifth-rates mounted from 32 to 60 guns. Sixth-rates embraced all vessels carrying fewer than 32 guns. Since the introduction of massive ordnance a first-rate may carry but 1 or 2 guns.

Rate is also the daily variation of a time-piece. *To rate*, to ascertain the rate of a time-piece. (See CHRONOMETER.) Also, to appoint a sailor to a higher grade. See RATING.

RATED SHIP. In former times, a *post-ship*.

RATING, or RATE. The position held by a man before the mast. When a man is rated by the commanding officer, he may be disrated by the same authority; otherwise, it requires the sentence of a court-martial.

Ration. The daily allowance of food to an officer, seaman, or marine. Its component parts are established by law, but may be varied by the Secretary of the Navy, or, when necessary, by the senior officer present in command; the latter may also, in case of necessity, diminish the allowance, but in such case payment must be made to the persons whose allowance is diminished according to the scale of prices established at the time of such diminution. Officers are entitled to one ration, or to commutation therefor, while at sea or attached to a sea-going vessel. The commutation price of the navy ration is fixed by law at 30 cents. Rations are allowed to midshipmen on the active list whether on sea-duty or not. Officers on the retired list are not entitled to rations. See PAY CORPS.

Rational Horizon. See HORIZON.

Ratlines. Small lines traversing the shrouds parallel with the water. They are from 14 to 16 inches apart, and serve the purpose of a ladder. Every fifth ratline extends to the swifter, and is called a *sheer-ratline*.

RATLINE-STUFF. Small stuff having from 12 to 24—generally 18—threads.

Rat's-tail. The tapering end of a rope. Also, the round tapered file used for enlarging holes in metal.

Rattan (Malay, *rotan*). The stem of a cane, of the genus *Calamus*, used for wicker-work, seats of chairs, etc. In the Eastern seas they constitute the chief cables, even to 42 inches circumference, infinitely stronger than hemp, light, and not easily chafed by rocks; very useful also to seamen for brooms, hoops, hanks for sail, etc.

Rattle Down. To hitch and seize the ratlines in their proper places.

Rave-hook. A hook iron implement used in cutting the butts of planking to afford sufficient opening for calking.

Raven's-duck. A fine quality of canvas for sails.

Ray. A flat rhomboidal fish with a rough skin; genus *Raia*.

Raze. To mark timber from a mold with a razing-knife. To cut down.

Razee. A vessel reduced by a deck; as, a line-of-battle ship converted into a frigate. *To razee*, to cut down.

Razor-back. The fin-whale (*Balænoptera*), so called from its prominent dorsal fin. It usually attains the length of 70 feet.

Razor-bill. A sea-fowl allied to the auks, *Alca torda*.

Razor-fish. A small fish of the Mediterranean,—*Coryphœna novacula*,—prized for the table. The *razor-shell*. See SOLEN.

Reach. A straight part between the curves in a stream. *To head-reach*, to forge ahead in stays.

Read, George Campbell, Rear-Admiral U.S.N. Born in Ireland; died at Philadelphia, August 22, 1862. Midshipman, April 2, 1804; lieutenant, April 25, 1810; commander, April 27, 1816; captain, March 3, 1825; rear-admiral, July 31, 1862. After the action between the U. S. frigate "Constitution" and the British frigate "Guerriere," August 19, 1812, in which his gallantry was conspicuous, he was selected to receive the sword of Capt. Dacres. October 25, 1812, he was present in the action between the "United States" and "Macedonian." At the time of his death he was governor of the Philadelphia Naval Asylum. He was a gallant and courteous officer, and of a commanding personal appearance.

Ream. To enlarge a cylindrical cavity; as, to ream out the bore of a gun. To shift the position of a vessel in fishing.

Rear. The farthest aft; as, a rear squadron.

Rear-Admiral. See ADMIRAL.

Rearing. Tumbling home,—applied to a ship's upper works.

Reasty. Rancid or rusty pork or butter, etc.

Réaumur's Thermometer. A thermometer named after its inventor. The freezing-point of water is marked 0°, and the boiling-point 80°.

Reballing. The catching of eels with earthworms attached to a ball of lead suspended by a string from a pole.

Rebate. See RABBET.

Receiver. In the compound steam-engine, a chamber which receives the steam expelled from the high-pressure cylinder and delivers it to the low-pressure cylinder. While the steam is retained in the receiver it is superheated by means of steam-jackets or other apparatus.

Receiving-ship. A ship stationed permanently in a harbor for the purpose of recruiting seamen and holding them in readiness for a cruiser.

Recife, also called Pernambuco, a city of Brazil, on the Atlantic, in lat. 8° 3′ 6″ N., lon. 34° 51′ 7″ W. It is divided into three distinct quarters, viz.: San Pedro, Goncalves, São Sacramento, and Boa Vista. It is the landing-place of a telegraph cable to Lisbon, and is also a railway terminus. The port is defended by 4 forts, and the harbor is protected by a large reef of rocks, and is accessible to vessels drawing not over 12 feet of water. It has a considerable trade with European ports, and the principal exports are cotton, sugar, and dye-wood. Pop. 117,000.

Reckoning. The ship's position as determined by observations and calculations. A vessel is *out of her reckoning* when her true position differs materially from the one in which she was calculated to be. See DEAD-RECKONING.

Recruiting for the Marine Corps. Men to enlist in the marines must be able-bodied, unmarried, and between the ages of 21 and 35 years. They must be not less than 5 feet 6 inches in height, of good character, and not addicted to the use of liquor. They must be able to read and write English properly as well as speak it; and no minors are wanted at all. Marines who have become infirm after 20 years' service, or who have been discharged for wounds received or sickness brought on in the service, are entitled to the benefits of the U. S. Naval Asylum at Philadelphia, Pa. The would-be recruit is required to swear that he is qualified in all respects, and it is impressed upon him that if he swears falsely he commits perjury, a crime punishable with 8 years' solitary confinement and $500 fine. The medical examination is as prescribed by the army and navy regulations. Particular attention is paid to the danger of color-blindness. It is most difficult to obtain the kind of men wanted, and the rejections average 9 to 10. When a man applies to enlist, the recruiting-officer's first care is to see that he has not been entrapped, or induced by false representation to enter the service. He personally explains the exact nature of the service, the length of the time, the pay, clothing, rations, and other allowances to which each soldier is entitled. It is incumbent upon him to be present at the examination of the recruit by the medical officer. Recruits are forwarded, under charge of a non-commissioned officer, from the rendezvous to the marine barracks designated by the colonel commandant.

The examination of privates for advancement to corporals consists of questions in reading, writing, and the simple rules of arithmetic, as to his knowledge of the duties of corporals and of the school of the soldier and company. The examinations for corporals to be sergeants is the same, with the addition that it is required the man shall have a knowledge of keeping the necessary accounts, making out muster-rolls, instruction for skirmishers, and the duties of a sergeant.

The following tables show respectively the strength of the marine corps at different periods of its history; the pay of non-commissioned officers, musicians, and privates; and the allowance of clothing to a marine during each year of his term of enlistment:

	Col. Comdt.	Comd. Staff.	Colonel.	Lieut.-Colonels.	Majors.	Captains.	First Lieuts.	Second Lieuts.	Non.-Com. Staff.	Sergeants.	Corporals.	Musicians.	Drummers.	Fifers.	Privates.
The strength of the marine corps, under the act of July 11, 1798, establishing and organizing a corps of marines, was	...	...	...	...	1	4	16	12	...	48	48	...	16	16	720
Under the act of 1799	...	...	...	...	1	4	18	18	...	56	48	...	25	25	890
Under the act of March 3, 1809	...	...	...	1	1	6	20	18	...	56	233	...	25	25	1484
Under the act of April 16, 1814	...	...	...	1	2	20	32	38	...	117	233	...	46	46	2180
Under the act of March 3, 1817. (Peace establishment.)	...	...	...	1	...	9	24	16	...	73	73	...	21	21	750
Under the act of June 30, 1834	1	...	...	1	4	13	20	20	4	80	80	...	30	30	1000
Under the act of March 3, 1847	1	4	...	1	4	17	24	24	4	105	105	...	55	55	2000
Under the act of July 25, 1861	1	5	1	2	4	20	30	30	4	200	220	30	60	60	2500

The grade of brigadier-general was established March 2, 1867, and abolished 6th June, 1874.

Pay-Table of Non-commissioned Officers, Musicians, and Privates of the U. S. Marine Corps.

Grades.	First Period of 5 Years' Service.	Second Period of 5 Years.	Third Period of 5 Years.	Fourth Period of 5 Years.	Fifth Period of 5 Years.
	Per month.	*Per month.*	*Per month.*	*Per month.*	*Per month.*
Sergeant-major	$23	$27	$28	$29	$30
Quartermaster-sergeant	23	27	28	29	30
Drum-major	22	26	27	28	29
First sergeant	22	26	27	28	29
Sergeant	17	21	22	23	24
Corporal	15	19	20	21	22
Drummers and fifers	13	17	18	19	20
Privates	13	17	18	19	20
Leader of the band	79	81	82	83	84
Musician, first-class	38	40	41	42	43
Musician, second-class	24	26	27	28	29
Musician, third-class	21	23	24	25	26

All enlisted men, except musicians of the band, serving on a first period of 5 years' service, are entitled to $1 per month for the 3d year, $2 per month for the 4th year, and $3 per month for the 5th year's service, in addition to the sums given in the first column above, which additional amounts are retained until expiration of service, and paid only upon final settlement and *honorable* discharge.

One dollar per month is retained from all enlisted men (except the marine band) serving under a re-enlistment. This retained pay is not included in the above table, and is to be credited and paid only upon final settlement and *honorable* discharge from service.

ALLOWANCE OF CLOTHING.

Recapitulation (for regular issues only).

	Clothing.	Full-dress Hats.	Pompons.	Caps. Undress.	Caps. Fatigue.	Caps. Storm.	Caps. Covers.	Caps. Ornaments.	Coats. Full-dress.	Coats. Undress.	Epaulet, bullion (sets).	Fatigue Jackets.	Overcoats.	Field-music. Full-dress Suits.	Field-music. Boys' Jackets. Full-dress.	Field-music. Boys' Jackets. Undress.	Gloves (pairs).	Trousers. Woolen.	Trousers. Linen.	Shirts. Flannel.	Shirts. Linen.	Drawers.	Socks (pairs).	Shoes (pairs).	Arctic Shoes (pairs).	Blankets.
Allowance.	First year	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	4	2	3	2	3	2	2	3	1	1
	Second year	...	...	...	1	...	2	1	...	...	...	1	...	...	...	...	4	2	1	2	2	2	2	3	...	...
	Third year	...	1	1	...	...	2	1	1	1	1	1	...	1	1	1	4	1	2	2	2	2	2	3	...	...
	Fourth year	...	...	...	1	...	2	1	...	...	...	1	...	...	...	...	4	2	1	2	2	2	2	3	...	1
	Fifth year	...	...	1	1	...	2	2	...	1	...	1	...	...	...	1	4	1	1	2	2	2	2	3	...	...
	Total	1	2	3	4	1	10	7	2	3	2	5	1	2	2	3	20	8	8	10	11	10	10	15	1	2

Redd. The spawn of fish. Also, the burrow scooped out by salmon in which to deposit their ova.

Red-eye. A fish of the carp family (*Leuciscus erythrophthalmus*), so named from the color of the iris; called also *rudd*.

Red-hot Shot. Shot made red hot in a furnace and used, before the introduction of shell, for incendiary purposes.

Red Pine (*Pinus rubra*). The red spruce.

Red-short Iron. Iron brittle when heated, and difficult to weld.

Reduce. To degrade to a lower rating.

Reef. That portion of a sail by which it is decreased or increased according to the force of the wind. Square-sails are reefed on the head; fore-and-aft sails are reefed on the foot; a lower studding is sometimes so fitted as to be reefed diagonally. *Close reef*, the last reef that can be put in. *Monkey-reefed*, the situation of sail with the yard on the cap and the reef-tackles hauled out. See BALANCE-REEF.

REEF-BAND. A strip of canvas stitched across the sail to support the strain of the reef-points.

REEF-CRINGLE. A cringle on the leech of a sail, through which the reef-earing reeves. See CRINGLE.

REEF-EARING. A small line used in reefing to haul up and secure the reef-cringle to the yard.

REEFER. A familiar term for a midshipman.

REEF-KNOT. A square knot; a knot used in tying reef-points,—the end parts come out parallel with the standing parts, and the knot does not jam.

REEF-PENDANT. A pendant hooked to a cringle on the leech of a course. In reefing, the clew-jigger is hooked into the thimble in the opposite end. See REEF-TACKLE.

REEF-POINTS. Short lengths of line fitted to the reef-band at equal distances from each other, and used to secure the reef-band to the yard. They are fitted in a variety of ways. Beckets are generally preferred for the first reefs of a topsail.

REEF-TACKLE. A tackle shackled; a cringle on the leech of a sail below the reef-bands; the upper block is secured at the extremity of the yard-arm, the fall leading to the deck. When the tackle is hauled on, the upper part of the leech is slacked so that the men can haul the reef-cringle up to the yard.

REEF-TACKLE CRINGLE. A cringle below the lowest reef-band, to which the reef-tackle is shackled. See CRINGLE.

Reel. A frame turning on its axis, upon which lines, hawsers, hose, etc., are wound.

Reem. To open the seams of a vessel by means of a reeming-iron.

Reeming. A term used by calkers for opening the seams of the plank with reeming-irons, that the oakum may be more readily admitted. This may be a corruption of *rimer*, for opening circular holes in metal.

REEMING-BEETLE. A heavy mallet hooped with iron, and used by calkers in striking a reeming-iron.

REEMING-IRON. A peculiar-shaped iron used by calkers to open the seams of wooden ships previous to calking.

Reeve. To pass, as a rope, through any aperture.

REEVING-LINE BEND. A bend used for uniting ropes or small hawsers; each end is half-hitched over and stopped along the opposite part.

Reflecting Circle. An astronomical instrument, the same in principle as the sextant, but the limb forms a complete circle.

Reflux. The running out of the tide.

Reformades (*Eng.*). The sons of the nobility and gentry who served in the navy under letters from Charles II., and were allowed table-money and other encouragements to raise the character of the service.

Refraction. The change of direction suffered by a ray of light in passing from one medium to another of different density. The incident and refracted rays lie in the same plane with the perpendicular to the surface at the point of incidence and on both sides of it. The sine of the angle of incidence bears to the sine of the angle of refraction a ratio dependent only on the nature of the media, and on the nature of the light.

REFRACTION, ASTRONOMICAL. The change in direction experienced by a ray of light from a heavenly body in passing through the earth's atmosphere. The term *refraction* is also applied to the correction to be applied to an altitude to reduce it to what it would be if the body were viewed through a medium of uniform density; and is, of all astronomical corrections, the most difficult to determine with accuracy. The effect of refraction is to cause the heavenly bodies to appear higher than they actually are. The refracting power of the atmosphere varies with its density, which is affected by its temperature and its moisture. In the zenith there is no refraction; near the zenith it is nearly proportional to the tangent of the apparent zenith distance,—the law, however, becomes complicated as we approach the horizon, where the refraction is greatest. At the horizon the refraction amounts to 33′, which is rather more than the apparent diameter of the sun or moon, so that when the lower limbs of those bodies are in the horizon, the bodies themselves are actually below it. The tables of refraction are constructed on the supposition that the barometer stands at 30 inches, and the temperature is 50° F., the corrections for other heights of thermometer and barometer being given in auxiliary tables.

REFRACTION, TERRESTRIAL. The change in position of a terrestrial object, due to the difference in density of different portions of the atmosphere. It is subject to great irregularity, and the amount varies $\frac{1}{8}$ to $\frac{1}{23}$ of the intercepted arc. The effect on the sea-horizon is of importance to the navigator. See DIP.

Refusal of a Pile. Its stoppage or obstruction, when it cannot be driven farther in.

Regatta. A rowing-match formerly peculiar to the republic of Venice; but the term is now applied to yacht and boat races in general.

Register. The enrollment of a ship at the custom-house, which confers peculiar privileges upon national-built ships. *Registry* is the evidence of such enrollment, and is the security of the ship's title.

Register, or Counter. In the steam-engine, an instrument for recording the number of revolutions made by the shaft. It consists essentially of a case containing a number, usually six, of suitably supported rings or disks, the periphery of each of which is marked with numbers from zero to 9, inclusive. The rings or disks are covered by a plate having openings to expose one figure of each, all the displayed figures appearing in a horizontal row. The first ring is, by mechanism, attached to any convenient part of the running-gear of the engine, moved through the space of one figure, or one-tenth of a revolution, at each revolution of the shaft, counting units; at the completion of each of its revolutions it turns the adjacent ring through the space of one figure counting tens; the second wheel moves the third in the same manner, counting hundreds; and so on to the last ring, when, if six rings are used, the highest number registered will be one less than a million, or, supposing the instrument to start from zero, one million revolutions will have been made when all six rings simultaneously return to zero. The reading of the register, or "counter," is recorded in the steam-log at the end of every hour.

Registers, United States Navy. Prior to 1814 no official annual navy register was issued from the Navy Department. Between 1798 and 1814 several lists of officers in the service were

published, containing the names of the officers in service at the date of their publication. The oldest separate publication of a navy list is a small 12mo of 32 pages, entitled:

"An Original and Correct List of the United States Navy, containing a list of the ships in commission and their respective force; a list of officers and their rank, as well those belonging to the navy as the marine corps; and a digest of the principal laws relating to the navy, etc., etc., etc. By Charles W. Goldsborough. City of Washington, November, 1800. Copyright secured according to law."

This register contains a list of the captures of French armed vessels by the ships of war of the United States during the quasi-war with France, amounting to 72; and it appears by it that the *personnel* of the navy then comprised 26 captains, 9 master-commandants, 109 lieutenants, 7 commanders of galleys, 35 surgeons, 28 surgeon's mates, 22 sailing-masters, 26 pursers, 359 midshipmen, 1 lieutenant-colonel commandant of marines, 4 captains, 18 first lieutenants, 18 second lieutenants of marines, 16 navy agents, and 2 navy constructors. In 1875 fifty copies were reprinted at my request by the chief of the Bureau of Construction in an octavo pamphlet of 12 pages.

The American State Papers, volume on Naval Affairs, contains a list of the officers in 1806, differing somewhat from the register for 1805–6,—published in the Philadelphia "Gentlemen's Annual Pocket Remembrancer" for the year 1806, which was reprinted with my annotations in 1875,—also a list of the officers of the navy and marine corps, February 3, 1812, with a statement of their rate of pay and rations allowed; a list for February 21, 1814, giving the date of appointment or commission of the officers, and a list of the vessels of the navy, with their rates, stations, and by whom commanded on the 4th of March, 1814; also another list for 1814, probably at the close of the year, which, in addition to the names, gives the rate of pay and the employment of each officer. The next list in the volume is the first of the series of navy registers, which has been continued annually ever since in compliance with a resolution of the Senate of the United States, passed December 13, 1815.

The volume also contains annual lists of the officers and their stations from 1818 to 1825, inclusive.

In 1813 there was published in Boston, in a 12mo pamphlet of 105 pages, "A Complete List of the American Navy, showing the name, number of guns, commanders' names, and stations of each vessel, with the names of all the officers in the service for October, 1813, and Steele's list of the navy of Great Britain for July, 1813. Boston. Published by Russell, Cutter & Co., and Joshua Belcher, 1813."

The preface informs us of the design and scope of the publication:

"In preparing the following pages for the press great pains have been taken to present to the public a more correct list of the American navy than has ever been published. Such a list, it is believed, is now completed, and the compiler is much indebted to the politeness of several gentlemen of the navy for the corrections which could not otherwise be obtained.

"The latest Steele's list to be procured is so far republished as to convey all the information respecting the British navy which possesses an interest for the general news reader.

"It is intended to publish every three months a corrected edition of these lists if the sale of the present promises encouragement to the undertaking.

"The deep and general interest which has been excited in the public mind by the valorous achievements of our naval heroes induces a belief that the permanent establishment of a complete list of the American navy must receive adequate patronage. Boston, September 30, 1813."

The anticipations of the publishers do not seem to have been realized, as no further lists appear to have been issued by them, and the Senate resolution of 1815 soon after rendered the printing of a register by private parties unnecessary. In addition to a list of the officers and ships of the United States navy and ships of the royal navy, the book contains an account of all the British vessels of war taken or destroyed in 1812 and 1813 up to the date of its publication; also an obituary of officers who had deceased during the war.

A register for 1815 was published in the "Naval Monument," a history of the naval events of the war of 1812–14, published in Boston in 1816, and another for the same year in the *Analectic Magazine.*

Registers for 1835 and 1836 were printed in the *United States Naval Magazine*, published under the auspices of the Naval Lyceum at the Brooklyn Navy-Yard.

In 1835, Benjamin Homans published a navy register, corrected to July 1, which was to be, but never was, continued annually. In 1843 and 1844, the same person published several quarterly registers, which were discontinued for want of patronage.

In 1848, Messrs. Mechlin & Winder compiled and published a General Register from 1798 to 1847, inclusive, the title of which was:

"A General Register of the Navy and Marine Corps of the United States alphabetically arranged, containing the names of all officers of the navy and marine corps, military and civil, commissioned and warrant, who have entered the service since the establishment of the Navy Department in 1798; showing the dates of their original rank and entry, the dates of their promotions to higher grades, and in what manner and when they left the service, if not still in it. To which is appended the Constitution of the United States, and a revised edition of all the laws in relation to the navy and marine corps, with reference to the 'Statutes at Large,' with an index. Compiled from the official records of the Navy Department, by authority of the Hon. John T. Mason, Secretary of the Navy, by Mechlin & Winder, attorneys and agents, office opposite War and Navy Departments, Washington City. Washington, C. Alexander, printer, 1848."

Many persons are not aware of the data, essential to the biographer and genealogist, which are contained in the United States Navy and Naval Academy registers. I will therefore note what may be found in them. Every Congressional district of the United States is entitled to be

represented by one cadet at the Naval Academy. Whenever a cadet dies, resigns, is dismissed, or graduates from the Academy, the vacancy is immediately filled by the member of the House, or Senator then in office, appointing a successor. The President of the United States also has the appointment of ten cadets at large, who are usually the sons of naval or military officers, or of his personal friends. Thus the Naval Academy has at all times a representative from each Congressional and Senatorial district of the United States, plus 10 appointed "at large" by the President.

No candidate is admitted, however, into the Naval Academy as a cadet midshipman until he has passed a satisfactory examination before the "Academical Board," and is, in the opinion of a medical board comprised of three medical officers of the U. S. navy, found in all respects physically sound, well formed, and of a robust constitution qualified to endure the arduous labors of an officer of the navy. All candidates are required to certify on honor their precise age, and none are examined who are under 14 or over 18, the prescribed limits as to age.

The candidate having passed the preliminary examinations, his height, weight, and lifting power are taken, and recorded in a register kept by the surgeon of the Academy. A like entry is recorded beneath it when he leaves the institution. A comparison of the two records shows his physical development while an under-graduate.

Immediately upon the cadet's admission, his name is enrolled upon the Academy register, with the name of the State from which he is appointed, the date of his admission to the Academy, and his age at admission in years and months, and this is printed in the first Academy register issued after his appointment. This information is continued for each academic year until he graduates, and there is added to it, in succeeding registers, his standing in his class each year, his order of merit in each of his studies and practical exercises, the sum of the demerits he has received during the year, and the total amount of his sea-service in practice-ships. There is also an account opened with each cadet in a large day-book, in which is recorded in full the nature of his offenses against good order and discipline, and the penalty exacted. When a cadet passes a whole month without receiving any demerit, 15 demerits are deducted from the number previously charged against him. If he receives 300 demerits he loses his position in the Academy. After graduation, a general merit-roll of the graduating class is made, to show the sum of the merits of each cadet in his several studies and exercises, together with his standing in the class at graduation, and this is printed in the Academy register.

The annual navy register also contains the names of the cadet midshipmen at the Naval Academy, alphabetically arranged in their classes, with the name of the States of their birth, the States from which appointed, the States of which a resident, and the date of their entering the Academy.

After graduation, the midshipman's name is entered on the navy register in his order of rank; and while the information previously given concerning him as a cadet on the navy register is continued, there is added the date of his graduation, his present duty, station or residence, his total sea-service (in years and months), total shore or other duty, how long employed, how long in the service, and the date of the expiration of his last cruise at sea.

On being promoted to the next higher grade, the date of graduation is omitted, and instead is shown the date of his present commission, and in another column his sea-service under present commission, and these columns are continued through all subsequent promotions. Thus, by an examination of successive registers, the date of each promotion and the amount of sea-service under it can be ascertained.

The same or similar information is given respecting the medical, pay, engineer, and other staff-officers not graduates of the Naval Academy.

The navy register also contains a list of the deaths, resignations, or dismissals during the preceding year, with the date of their occurrence, and in case of death, the place of death; also a list of all the retired and reserved officers, and a table exhibiting the pay of all officers of the navy and marine corps, whether at sea, on shore-duty, on leave, on waiting orders, or retired.

The total amount of the pay and mileage actually received by each and every officer of the navy and marine corps is presented to Congress under a general law, and has been usually, if not always, annually printed in a separate document.

In addition to the annual register, which is brought up to the 1st of January and is usually issued about the 1st of March, since 1866 there has been a register issued in July, giving the name and rank of every officer in the naval service, the State of which he is a resident, the date of his present leave or order, and present duty, station, or residence. With regard to officers on the retired list, it gives the law under which each officer was retired, his name and rank, the State of which he was a resident when appointed, the date of his retirement, his rank when retired, by which his pay on the retired list is regulated, and his present place of residence or address.

Annual official navy registers have been published since 1815, in compliance with a resolution of the U. S. Senate of December 13, 1815; the Naval Academy registers since 1858.—*George H. Preble, Rear-Admiral U.S.N.*

Register-ship. A Spanish plate-ship or galleon.

Regular. The *regular* army or navy, in the United States, is that portion of the land or sea forces which is permanently maintained in the service of the Union, as contradistinguished from that which is called into service temporarily in time of war.

Regulator. A valve, with necessary attachments, for instantaneously controlling the quantity of steam admitted to an engine either by hand or by means of an automatic governor. When operated by hand it is commonly called a *throttle-valve.*

Regulus. The star *a Leonis.* The word is a translation of the Greek name *basiliskos*, little king. In the constellation *Leo* six stars form the rude outline of a sickle, Regulus being at the end of the handle. See Leo.

Reid, Samuel Chester, Sailing-Master U.S.N. Born in Norwich, Conn., August 25, 1783; died

in New York City, January 28, 1861. He went to sea at 11; was captured by a French privateer, and was 6 months a prisoner at Basseterre. He served as acting midshipman in the "Baltimore," in Commodore Truxtun's West India Squadron, and during the war of 1812 commanded the privateer brig "Gen. Armstrong," with which he fought one of the most remarkable naval battles on record, at Fayal, September 26 and 27, 1814. Her force was 7 guns and 90 men. She was attacked by the boats of the "Plantagenet," 74, "Rota," 44, and "Carnation," 18. Reid succeeded in thoroughly disabling and defeating the enemy, and scuttled his own vessel to prevent her capture. The British lost 120 killed and 130 wounded. The Americans had 2 killed and 7 wounded. The attack upon the "Armstrong," in a neutral port, led to a protracted diplomatic correspondence, but the arbitration of Louis Napoleon decided the case against the Americans. Capt. Reid was appointed a sailing-master in the navy, and held the office till his death.

Reigning Winds. The prevailing winds.

Reinforce. An additional thickness given to an object to enable it to withstand strain or pressure brought upon a certain point. The part of a gun having the thickest walls; it extends from the base-line to the chase.

Relief-valve. A valve confined to its seat by adjustable weights or springs, so regulated that it will open under any suddenly accumulated pressure; as, *cylinder relief-valves* or *snifting-valves*, which release water of condensation, or that due to priming of boilers, from a steam-cylinder when obstructing the motion of the piston. Such valves are usually operated by hand.

Relieving-tackles. Tackles hooked to the tiller to steer the ship in case of accident to the wheel or wheel-ropes, and also to assist in steering in heavy weather.

Remark-book. A book containing the navigator's memoranda of hydrographical information.

Remey, William B., Judge-Advocate-General. Born in Iowa. Commissioned as second lieutenant, marine corps, Nov. 25, 1861; frigate "Sabine," S. A. Blockading Squadron, 1861–63; marine barracks, Norfolk, 1863–64.

Commissioned first lieutenant, February 17, 1864; receiving-ship at New York, 1864–65; steamer "Vanderbilt," special service, 1865, and Pacific Squadron, 1866–67; receiving-ship "New Hampshire," Norfolk, 1867–68; marine barracks, Philadelphia, 1868–69; Jan. 13, 1870, reported at headquarters marine corps, as instructor in army code of signals; July 2, 1870, appointed judge-advocate of the marine corps, and served as such until 1873.

Commissioned captain, June 21, 1872; "Colorado," North Atlantic Station, 1873–74; judge-advocate, marine corps, 1874–75; fleet marine officer, South Pacific Station, 1875–76, and of South Atlantic Station, 1876–77; acting adjutant marine corps, October to December, 1877; marine barracks, Norfolk, Dec. 1877, to May, 1878; member Board of Inspection, May to July, 1878; acting judge-advocate-general, Navy Department, July, 1878, to June, 1880.

Commissioned judge-advocate-general of the navy, with the rank of colonel in the marine corps, for the term of 4 years from June 9, 1880.

Render. To pass freely, as a rope through a block.

Rendezvous. The port or place of destination where the several ships of a fleet are appointed to join company.

Rends. Large shakes or splits in timber and plank.

Repeat. To *repeat* a signal, to duplicate a signal intended for a third ship, that it may be more easily read.

Repeater. One of three pennants which indicate, respectively, that the first, second, or third flag in a hoist of signals is duplicated.

Repeating Circle. An astronomical circle which repeats the measurement of an angle without multiplying the single reading of the instrument, thus theoretically reducing the error of imperfect graduation.

Representation. A collateral statement of such facts not inserted in the policy of insurance as may give the underwriters a just estimate of the risk of the adventure.

Reprisal. A mode of redress granted by the sovereign to one or more subjects for some specific injuries; the grant is by commission or letter of marque.

Requisition. An official demand for stores, etc.

Rescue. A rescue effected by the crew when the captors are in lawful possession is unlawful, and is a resistance within the penalty of confiscation.

Reserve, Royal Naval. The naval reserve of Great Britain is divided into three classes, and consists, by the last returns, of a total of 17,067 men. Of these, 11,930 belong to the first class. The rules for enrollment are as follows: The applicant must be of good character and health; must not be above 30 years of age, excepting in the case of the men of the royal navy, who, if they are able seamen, may be received up to the age of 35. For the first class, the applicant must have had at least 5 years' sea-service within the preceding 10 years, and at least one of these years as able seaman. He must show that he has been to sea within 4 months of the time of his application, and must declare his intention of following the sea 5 years longer. If he cannot prove his application, he must satisfy a board of two naval officers of his fitness.

An applicant for the second class must show 3 years' sea-service, and of this time at least 6 months as ordinary seaman. Men in the coasting trade, or those who are making short voyages, are preferred for the second class.

The third class is made up of boys who have been trained in the mercantile training-ship, the sum of £3 being granted by the government to the management of a training-ship for each boy supplied. He must have been 2 years under training in a ship, subject to inspection by the Admiralty and Board of Trade. He must also be under engagement to serve in a ship at sea. He must be 16 years of age, not less than 5 feet 1 inch in height, 30 inches round the chest, robust, and intelligent; must be able to read and write, and must show satisfactory proficiency in the usual drills on board men-of-war, and in elementary seamanship, and must produce a certificate of good character from the captain of his training-ship. They will be, on attaining 19 years of age, provided they have served 6 months at sea, eligible for the second class, and higher if

qualified. These regulations do not apply to boys from reformatory ships, who are not received.

The enrollment is for 5 years, and 4 enrollments must be served in order to get a pension. No pension is allowed to any one who does not pass from the second into the first class; but half the time passed in the second class is allowed to count for pension in case the individual passes into the first class.

The yearly drill is for 28 days. This may be taken, except in the first year, in periods of 7 days each. There are 9 drill-ships stationed at as many ports, and a number of shore batteries, where the men assemble for drill. Nothing is taught here but the usual arm-drills of the service, no seamanship exercises taking place. While assembled for drill, the men are rated and paid as seamen and ordinary seamen of the navy, and have their traveling expenses paid to and fro. They are required to appear in a uniform cap and dark blue clothing.

Any man desiring to make a voyage of longer duration than 6 months must get leave to do so, this leave never extending beyond a year; nor can a man leave the country until he has made his year's drill. Among the men of the reserve are 47 masters of vessels, 518 mates, and 3815 petty officers in the merchant service.

The retainer for men of the first class is £6 annually; for men of the second class, £2 10s.

The reserves can only be called out by royal proclamation. Their period of service, under such proclamation, is for 3 years, unless war is declared, in which case they may be held 2 years longer.

The master of a merchant vessel who belongs to the naval reserve may fly the blue ensign, if he is provided with an admiralty warrant, and if 10 at least of his crew are men of the reserve.

The estimates for the reserves for the year 1880-81 are £213,883, of which amount the annual retainer amounts to £7900; drill-pay and lodging allowance to £37,000; erection and repair of batteries for drill, £7000; sea-pay of officers and crews of the naval reserve drill-ships, £24,552.

Great efforts are made to attract the fisherman class to this force, as these men and those serving in coasting vessels are always at hand, and can attain their yearly drills with less difficulty than can those making long voyages.—*F. E. Chadwick, Lieutenant-Commander U.S.N.*

Respondentia. A bond which is a loan on the pledge of the cargo, generally a personal obligation of the borrower, and not a specific lien on the goods unless stipulated. It amounts at most to an equitable lien on the salvage in case of loss. See BOTTOMRY.

Ret. To soak in water, as in seasoning timber, hemp, etc.

Retard or Age of the Tide. The interval between the transit of the moon and the making of the tide. See TIDE.

Reticule. The system of cross-wires in the focus of an astronomical instrument.

Reticulum. See CONSTELLATION.

Retirement. The legally established process by which an officer worn by long service, superannuated, or disabled by wounds or disease, is honorably withdrawn from active service. The whole number of officers thus withdrawn is termed the *retired list.* Retirement is either voluntary or compulsory. Voluntary retirement takes place in the case of an officer who has been 40 years in the service of the United States, and who makes application to be retired, except he be either a lieutenant-commander, lieutenant, master, ensign, midshipman, passed assistant surgeon, passed assistant paymaster, first assistant engineer, assistant surgeon, assistant paymaster, or second assistant surgeon, in which grades an officer can be retired only on account of physical or mental disability.

Retirement is compulsory in the case of an officer, below the rank of vice-admiral, who has attained the age of 62 years, unless he be of one of the grades last above mentioned, or, being not below the grade of commander, shall have received, during the war for the suppression of the Rebellion, the thanks of Congress for distinguished service; in which latter case he cannot be retired, except on his own application or for disability, until he shall have been 55 years in the service. The other cases in which retirement is compulsory are where an officer having been examined for promotion shall not have been recommended therefor; and where an officer is found by a retiring board to be incapacitated for active service, said incapacity being the result of an incident of the service. If, however, the board find that the incapacity be not the result of any incident of the service, the officer is retired on furlough pay, or *wholly retired,* as the President shall determine. Officers wholly retired receive one year's pay and are dropped.

Retired officers are borne upon the Navy Register in their respective grades, are entitled to wear the uniform, and are subject to the rules and articles for the government of the navy, and to trial by general court-martial. They are withdrawn from command, and cannot be employed on any active duty except in time of war, when the President, by and with the advice and consent of the Senate, may detail them for the command of squadrons and single ships, when he believes that the good of the service requires that they shall be so placed in command. In making such details the President may select any officer not below the grade of commander and assign him to the command of a squadron, with the rank and title of "flag-officer," and the officer so assigned shall have the same authority and receive the same obedience from the commanders of ships in his squadron holding commissions of an older date than his that he would be entitled to receive if his commission were the oldest. Retired officers so detailed may be restored to the active list, if upon the recommendation of the President they shall receive a vote of thanks of Congress for distinguished service, but not otherwise.

Officers on the retired list are entitled to promotion as their several dates on the active list are promoted. In the case of rear-admirals, however, the number of that grade by promotion on the retired list is limited to nine (except that the Secretary of the Navy may promote to the grade of rear-admiral on that list, in addition to the number mentioned, commodores who have commanded squadrons by order of the Secretary of the Navy, or have performed other highly meritorious service, or who, being at the outbreak of the war of the Rebellion citizens of any State

which engaged in such Rebellion, adhered to the flag of the United States), and there can be no promotion to rear-admiral on the retired list while there shall be in that grade the full number allowed by law. Officers promoted on the retired list receive no increase of pay in consequence of such promotion. See EXAMINATION OF OFFICERS FOR PROMOTION AND RETIREMENT, BOARD OF.

Retractor. A device for withdrawing the cartridge-case from breech-loading arms.

Retractus Aquæ. An old law-term for the ebb or return of tide.

Retreat. A call of the bugle or beat of a drum to announce the termination of a drill.

Retrograde Motion. The general motion of all the planets among the stars is eastward or *direct*. When they come into the quarter of the sky which is opposite the sun, their motion is westward, or *retrograde*.

Returns. Reports and statements made periodically.

Return-salute. See SALUTES.

Revenue Marine Service. The first step in this country toward an organized force for the protection of the revenues from duties on imports was made under an Act of Congress, approved August 4, 1790, which provided for building and equipping 10 revenue-cutters, each to be officered and manned by one master and not more than three mates, who should be appointed by the President, and be deemed officers of the customs.

The objects for which the revenue-cutters were thus authorized were specifically set forth in a communication to Congress from Alexander Hamilton, Secretary of the Treasury, and were understood to be mainly for the enforcement of the customs laws throughout the whole extent of the sea-board. Two of the cutters were intended for the coasts, bays, and harbors of New Hampshire and Massachusetts; one for Long Island Sound; one for the bay of New York; one for Delaware Bay; two for the Chesapeake; and one each for the coasts and harbors of North Carolina, South Carolina, and Georgia. Hamilton said, "Boats of from 36 to 40 feet keel will answer this purpose, each having 1 captain, 1 lieutenant, and 6 mariners, and armed with swivels;" and after estimating the first cost of one of these vessels completely equipped at $1000, he continued: "The utility of an establishment of this kind must depend on the exertion, vigilance, and fidelity of those to whom the charge of the boats shall be confided. If they are not respectable characters they will rather serve to screen than to detect fraud. To procure such a liberal compensation should be given. He suggested giving the officers military or naval rank, "which," he added, "will not only induce fit men to engage, but attach them to their duties by a nicer sense of honor." Immediately after the passage of the act, letters were addressed to the collectors of customs at Boston, New York, Philadelphia, and Baltimore, authorizing the construction and equipment of such cutters as were considered suitable for the service in their respective districts. The records of the Treasury Department contain considerable correspondence on the subject of the proposed establishment, and perhaps many obstacles occasioned delay, for the first list of cutters found is dated February 19, 1793, and shows that on October 1, 1792, but 8 of these vessels were in commission, as follows:

Cutter.	Coast on which stationed.	Master.	Rig.	Guns.
Scammel.........	N. Hampshire	Hopeley Yeaton....	Schr.	14
Massachusetts..	Massachusetts	J. Foster Williams	Brig.	"
Argus.............	Connecticut...	Jonathan Maltbie.	Schr.	"
Vigilant	New York.....	Patrick Dennis.....	"	"
Gen. Greene....	Pennsylvania	Jas. Montgomery..	Sloop	10
Active............	Maryland......	David Porter........	Schr.	14
Virginia	Virginia........	Richard Taylor....	"	12
Diligence........	N. Carolina....	Wm. Cook...........	"	....

Two others are mentioned as being in course of construction for the coasts of South Carolina and Georgia. They were probably the "South Carolina" and the "Pickering," subsequently mentioned with others in the above list as co-operating with the navy.

On March 2, 1793, an act was passed authorizing an increase in the number of mariners, and a slight increase of pay for officers and men, the pay having been fixed by the original act, for captain, at $30 per month, and mates, or lieutenants, at $20, $16, and $14, respectively, besides which each officer was entitled to the allowances of an officer of the army of corresponding grade, while the men received each $8 per month and subsistence. This pay was further increased by act of May 6, 1796, which also gave to revenue-cutter officers half of the amounts of fines, penalties, and forfeitures collected upon information furnished by them.

June 14, 1797, an act was approved which authorized the President, if circumstances should thereafter arise which, in his opinion, might render it expedient, to increase the strength of the several revenue-cutters, so that the number of men employed should not exceed 30 marines and seamen to each cutter, "and cause said revenue-cutters to be employed to defend the sea-coast, and to repel any hostility to their vessels and commerce within their jurisdiction, having due regard to the duty of said cutters in the protection of the revenue." It was also provided that the act should continue in force for the term of 1 year, "and from thence to the end of the next session of Congress, and no longer."

The increase of men and addition to the powers and duties of the cutters by this act were doubtless in view of threatened hostilities with France.

In October of 1798, the President, "with a view of producing a concert of action of the naval forces of the United States," placed the armed revenue-cutters at the disposition of the Secretary of the Navy. The revenue vessels selected for this purpose were the "Pickering," "Eagle," "Scammel," "Governor Jay," "Virginia," "Diligence," "South Carolina," and "Gen. Greene." They were employed in cruising among the West Indies, or between the islands and the United States, under command of officers of the navy who had but recently been appointed from the merchant service, and in a few instances from the revenue-cutters. About the close of the year 1798, 4 of these vessels were permanently attached to the navy, and the

others returned to the Treasury Department or revenue service.

On March 2, 1799, an act of Congress was approved which was entitled "An act to regulate collection of duties on imports and tonnage." It embraced many of the provisions of previous acts, with numerous new features which the growth of the nation and experience demanded. Six sections of this act relate to revenue-cutters, and are briefly as follows: The President was empowered, "for the better securing the collection of duties imposed on goods, wares, and merchandise imported into the United States, and on the tonnage of ships or vessels, to cause to be built and equipped so many revenue-cutters, not exceeding 10, as may be necessary to be employed for the protection of the revenue, the expense whereof to be paid out of the product of said duties." For each of said cutters there was to be 1 captain, and not more than 3 lieutenants,—first, second, and third,—and not more than 70 men, including non-commissioned officers, gunners, and mariners. The cutters were to co-operate with the navy whenever the President should so direct. The officers were to be appointed by the President, and be deemed officers of the customs, and, as such, subject to the direction of such collectors of customs, or other officers thereof, as from time to time might be designated for the purpose; and they were empowered, authorized, required, and directed to go on board all ships or vessels arriving within the United States, or within 4 leagues of the coast thereof, if bound for the United States, and to search and examine the same, and every part thereof; and to demand, receive, and certify the manifests required by law, and to affix and put proper fastenings on the hold, hatches, and other communications with the hold of any ship or vessel, and to remain on board the said ships or vessels until they arrive at the port or place of their destination.

The commanders of revenue-cutters were also required to make weekly returns to the collectors of the transactions of their commands, with minute details of all vessels boarded and examined, and all services performed. Such other duties as the Secretary of the Treasury might from time to time enjoin or direct for the collection or security of the revenue were also to be executed by these vessels. New cutters were provided for in lieu of those unfit for service, which were to be sold. A distinctive ensign and pennant for the cutters was also provided for, to be prescribed by the President; and in case any vessel liable to examination or seizure failed to bring to, on being required, or chased by a cutter displaying the ensign and pennant, it was made lawful for the commanding officer to fire at, or into, such vessel after having fired a gun as a signal, and he, or his subordinate, to be indemnified from any penalties or action for damages for so doing; and if any person should be killed or wounded by such firing, and if the commanding officer, or other person acting under his direction, should be prosecuted or arrested therefor, he was to be forthwith admitted to bail. A penalty of $100 was prescribed against the master of any vessel, not in the service of the revenue, who should carry or hoist the ensign prescribed for the cutters.

Another act of same date prescribed the compensation for the commissioned officers, and the rate of wages and rations for non-commissioned officers, gunners, and mariners. The terms of this act, so far as they apply to the powers and duties of officers, have not been changed by subsequent legislation.

The number of cutters employed from 1793 up to 1820 cannot be accurately stated, as the necessary information is not at present accessible. During that period there were frequent disturbances in the foreign relations of the country, which, on account of the limited number of naval vessels, often compelled the government to divert the cutters from their regular duties in anticipation of hostilities, or to engage in actual war.

The causes that led to the reduction of the navy in 1801, to wit: the cessation of hostilities with France, and the necessity for retrenchment in the expenses of the government, operated in like manner to reduce the number of revenue-cutters. The size of the vessels, also, which in some instances had reached nearly 200 tons, was now limited to 130 tons. In 1809, however, the number of cutters was increased, probably on account of the famous embargo act of 1807, which was repealed in 1809, except so far as related to Great Britain and France and their dependencies.

In the war of 1812 the cutters were usefully employed as dispatch-vessels, and for coast defense, duties for which their light draft and good sailing qualities well fitted them, and on several occasions they encountered the enemy's vessels and boat expeditions with creditable results.

The scope of this article does not admit of the details of particular incidents, or the achievements of individuals, but there was one affair in which a cutter was captured after a gallant defense that deserves mention on account of the unusual compliment paid to her commander by his captor. On the night of June 12, 1813, the revenue-cutter "Surveyor," Capt. S. Travis, on the Chesapeake station, was captured by the barges of the British frigate "Narcissus." The enemy was discovered by the cutter when about 150 yards distant; as the latter's guns could not be brought to bear, each of her crew was furnished with two muskets, and their fire was held until the British were within pistol-shot. The engagement was sharp, but the enemy carried the vessel by boarding, losing 3 men killed and a number wounded. Capt. Travis and his crew, 15 in number, were taken on board the "Junon," and the next day the senior officer of the "Narcissus" returned the captain his sword with the following letter:

"HIS MAJESTY'S SHIP 'NARCISSUS,'
"June 13, 1813."

"SIR,—Your gallant and desperate attempt to defend your vessel against more than double your number, on the night of the 12th inst., excited such admiration on the part of your opponents as I have seldom witnessed, and induced me to return you the sword you had so nobly used, in testimony of mine. Our poor fellows have severely suffered, occasioned chiefly, if not solely, by the precautions you had taken to prevent surprise; in short, I am at a loss which to admire most, the previous engagement on board

the 'Surveyor,' or the determined manner by which her deck was disputed, inch by inch.

"I am sir, with much respect,

"JOHN CRERIE.

"Capt. S. TRAVIS, U. S. cutter 'Surveyor.'"

In addition to the active services of the cutters in connection with the war, they found busy employment in the suppression of smuggling and piracy, which had become quite common pursuits of the many adventurers attracted to American waters by the unsettled condition of the country.

From 1820 to 1830 no greater number than 10 cutters were employed in any one year, and the lists of officers during that period contain the names of a few who also belonged to the navy. It appears that in 1821 several officers of the navy, mostly midshipmen, obtained furloughs for one year, with permission to accept temporary appointments in the revenue-cutter service, and this practice continued until the spring of 1832, when it ceased under the terms of a circular issued by Louis McLane, Secretary of the Treasury, dated January 17, 1832, in which it was stated that experience having shown that the employment of officers of the navy in revenue vessels was liable to objection, it was deemed proper to discontinue the practice and keep the two services distinct and separate. Officers of the navy then employed in the revenue-cutter service were informed that their commissions as revenue-cutter officers would be revoked on the 30th of April following, and for the greater efficiency of the cutter service, it was determined that promotions would thereafter be made from among the officers of that service, having due regard to fitness as well as seniority. The most of the navy officers then attached to the cutters returned to their own service, while others, about a dozen, resigned from the navy and retained their commissions in the revenue-cutter service.

At this period there was a gradual extension of the service, and in 1833, 21 cutters are found in commission, fully officered. They were generally schooners, many carrying fore-topsails, and guarded the Atlantic, Gulf, and Lake coasts. During the nullification times of 1832–33, several of the cutters were stationed at and off Charleston, S. C., to enforce the customs laws. Four at least were there in the latter part of 1832, and, joined by two or three others during the winter, remained until the spring, when the troubles ended and the revenue vessels returned to their respective stations along the coast. About this time too (1833), certain of the vessels were engaged in cruising on the coast, under special orders, during the winter months to aid and assist distressed vessels, a duty with which they were familiar, incidentally with former cruises in their regular line of service. This duty afterwards became imperative and annually recurring, under the act of December 22, 1837, by which the President is authorized to cause any suitable number of public vessels adapted to the purpose to cruise upon the coast in the severe portion of the season, "and to afford such aid to distressed navigators as their circumstances may require." After the passage of the act, a frigate, a sloop-of-war, and 3 brigs of the navy were ordered on that service with 8 of the cutters. The naval vessels proved to be too large and unwieldy for the coast service, and were withdrawn at an early day. From this time the protection of commerce in this regard devolved upon the revenue vessels, which have been employed under the act during every winter up to the present time, with such satisfactory results as to earn for the service generally a deserved popularity, especially with all persons connected with the maritime interests of the country.

Early in 1836, several cutters were ordered to Florida to co-operate with the army and navy against the Seminoles, and at one period during that war there were 6 cutters employed, carrying dispatches, transporting troops and supplies, and in cruising along the coast and among the keys, affording protection to the settlers from hostile Indians.

Among other duties performed by the cutters from their first establishment, was the inspection and supply of light-houses and buoys under the direction of collectors of customs. In 1845 the light-houses were placed in charge of the Revenue Marine Bureau, and the cutters were more actively employed than formerly on light-house duty. This continued until the establishment of the present Light-House Board in 1852, when the improved character of that service required vessels especially adapted for its work.

Steamers were first introduced into the revenue-cutter service in 1845, when 4 were put in commission, and 4 others in course of construction. These steamers were built of iron, and being almost the first vessels constructed of that material in this country, were comparatively experimental, and afterwards proved to be unsuitable for the service. In the following year, however, two of them, the "McLane" and the "Legare," with the sailing-cutters "Ewing," "Forward," and "Woodbury," performed efficient service in co-operation with the army and navy on the coast of Mexico. The "McLane" and the "Forward" participated in the naval attack on Tabasco in October, 1846, and subsequently in the attack on Alvarado. They were also engaged in blockading the Mexican Gulf ports, and in conveying dispatches, and for their services generally their officers were highly commended by the commanders-in-chief of the U.S. military and naval forces engaged in the war with Mexico.

After the close of the war these steamers were laid up. A few were afterwards transferred to the coast survey, and the rest otherwise disposed of, so that in 1849 the name of but one was retained on the list of cutters. This was the "Polk," from which the machinery was removed and the vessel rigged as a bark for the Pacific coast, where the new brig "Laurence" had already been sent. In that year there were but 11 cutters in active service, an ill-advised economy having reduced their number instead of otherwise retrenching the expenses caused by the introduction of costly and unsuitable steamers, and correcting the evils that always spring up during a period of war. In a short time, however, the bad results of this reduction being shown in the growth of smuggling and other violations of law, an increase of the service was found necessary, and in 1852, 6 new vessels were authorized. In 1855, 4 new cutters were added by an act which also provided that no person shall be appointed captain, first, second, or third lieutenant who

does not adduce competent proof of proficiency and skill in seamanship and navigation.

In the following year 6 cutters were provided for the lakes, and the next year a side-wheel steamer was authorized. This steamer was afterwards known as the "Harriet Lane," and had a somewhat notable career. She was ordered by the President to co-operate in the naval expedition to Paraguay, and rendered valuable services. In the beginning of the Rebellion she was under fire at the attack upon Fort Hatteras, and during a reconnoissance of the rebel batteries near Norfolk, and was subsequently transferred to the navy.

During the Rebellion the service was considerably increased. Several vacancies occurred by the resignation of officers of Southern birth. To fill these, and supply the additional vessels with officers, many appointments were made from the merchant service, which was also largely drawn upon for the volunteer navy, and several came into the revenue marine who had previously had but little sea experience. Examining boards to determine the professional qualifications of the candidates were then held, as now, but the urgency of the demand for officers compelled the exercise of leniency in the examinations. The cutters were variously employed during the war, some as dispatch-vessels, others in convoying transports or cruising after privateers. The steamer "Naugatuck" took part in the naval attack on Fort Darling, and the revenue-steamer "Reliance," while pursuing blockade-runners on the Maryland shores, was fired into by some land forces of the enemy, and her commanding officer, Capt. Thomas Dungan, was killed.

The same injurious effects which had resulted from the participation of the revenue vessels in former wars were apparent throughout the service with the return of peace.

In 1871, a much-needed reorganization was effected under the then Secretary of the Treasury, Hon. George S. Boutwell. All officers were subjected to a rigid examination as to their professional qualifications, and those found incompetent were removed. The vacancies thus caused were filled by others who had successfully passed competitive examinations. The old and unsuitable vessels were sold, or altered and repaired, and new vessels specially designed for the service were built. The imperfect system under which the service had been managed gave place to a carefully-devised plan, which exacted a strict accountability from all officers in charge of public property, and instituted many wholesome reforms in the expenditure of the appropriations for the service. The establishment of regular boards of examination and the introduction of the competitive system in the promotions to higher grades stimulated the officers generally to industrious application in the studies necessary for their improvement. The result of this reorganization was soon manifested in the increased efficiency of the whole service and the reduction in its annual expenses.

In 1876, an act of Congress was passed which provides as follows: "That hereafter, upon the occurring of a vacancy in the grade of third lieutenant in the Revenue Marine Service, the Secretary of the Treasury may appoint a cadet not less than 18 nor more than 25 years of age, with rank next below that of third lieutenant, whose pay shall be three-fourths that of a third lieutenant, and who shall not be appointed to a higher grade until he shall have served a satisfactory probationary term of two years and passed the examination required by the regulations of said service." Under this act boards of examination are held for candidates for admission to the grade of cadet. The scope of the examination, while searching in its character, covers only the ordinary English branches, but the competitive system being adhered to, the appointments are not controlled by political or personal favoritism.

The cadets are first sent on a practice-cruise at sea in a revenue-cutter detailed for the purpose, and are carefully trained in practical navigation and seamanship. During the winter they are instructed in mathematics and such other studies as will best fit them for the proper performance of their duties as officers. A second cruise at sea is followed by another winter of study and training on shipboard, when, after examination, they are, if found competent, appointed third lieutenants in the service.

By an act of Congress, the Secretary of the Treasury has power to designate other necessary duties for the cutters than those previously mentioned under the act of March 2, 1799. These have come to be various, the cutters having been sent on many special cruises in search of missing vessels, or in the enforcement of the neutrality laws by preventing armed expeditions against neighboring and friendly governments. The suppression of mutiny on board vessels arriving at or sailing from our ports is a frequent service performed by the cutters. Since the acquisition of Alaska, its shores and the neighboring islands have been visited annually by one or more of the revenue vessels on the Pacific coast; and since the withdrawal of the U. S. troops from the Territory, the cutters have afforded the principal means for enforcing the law and protecting the people in that remote country. At this writing (June, 1880) the revenue-steamer "Corwin" is on her way to the Aleutian Islands, with instructions to extend her cruise into the Arctic Ocean, in search of two missing whalers; also to bring back tidings, if possible, of the Arctic exploring steamer "Jeannette."

Under an act passed June 18, 1878, officers of the revenue marine are detailed as inspectors and assistant inspectors of life-saving stations, and act as such under the direction of the general superintendent of that service. For this duty they are well fitted by their familiarity with the coast, as well as from the long association of the two services, which dates back to the first establishment of the life-saving stations, in 1848. While thus employed, however, the officers do not neglect their regular duties in the protection of the revenues, and, with two or three exceptions, remain in command, or are attached to revenue vessels.

A fair estimate of the usefulness of the revenue cutters may be drawn from the following statement, which embraces a period of nine fiscal years, or from June 30, 1871, to June 30, 1879, viz.:

Number of vessels boarded and examined	218,479
" " seized or reported for violation of law	14,192
" " in distress assisted	1,578
" miles sailed and steamed	1,600,679
" lives saved	555

These figures are obtained from the reports of the vessels, made on a form in use only since 1871. If it were practicable to examine all the log-books or reports of the cutters since the first establishment of the service, quite as satisfactory figures would no doubt be shown.

The records of the Treasury Department do not furnish a complete statement of the total value of the services rendered by the cutters to the commerce of the country, but from the reports made during the last 3 years, it is certain that property consisting of vessels and cargoes, imperiled by the sea, of the value of $9,148,435.80, has been assisted and saved by the revenue-cutters, or about five times the total cost to the United States of the whole fleet of revenue-cutters, and it will be apparent that the aggregate would be enormous could it be ascertained for the period since the organization of the service.

There are at present employed in the revenue marine 23 propellers, 8 side-wheel steamers, 1 bark, 1 schooner, and 4 sloops. These vessels are stationed in the principal ports on the Atlantic and Pacific coasts, and in four of the Great Lakes, and their cruising-grounds cover the whole coast of the United States.

Their armament is from 1 to 4 light guns, and sufficient small-arms, according to the size of the vessel and the probable necessities of the station to which they are assigned.

The officers consist of 34 captains, 34 first lieutenants, 34 second lieutenants, 34 third lieutenants and cadets, 23 chief engineers, 18 first assistant engineers, and 27 second assistant engineers.

By act of February 4, 1863, captains in the revenue marine rank with and next after lieutenants commanding in the navy.

First lieutenants with and next after lieutenants.

Second lieutenants with and next after masters.

Third lieutenants with and next after ensigns.

The present duty pay of officers under act of February 28, 1867, is as follows:

Captains	$2500	per annum and	1	navy ration.
First lieutenants	1800	"	"	"
Second "	1500	"	"	"
Third "	1200	"	"	"
Chief engineer	1800	"	"	"
First asst. engineer	1500	"	"	"
Second " "	1200	"	"	"
Cadet	900	"	"	"

The wages of petty officers and crews are regulated by the Secretary of the Treasury from time to time, in accordance with the port wages for merchant seamen in the place where the cutter may be stationed. The number of petty officers and seamen for each vessel is also regulated in like manner according to the size of the cutter and the necessities of her station, rarely exceeding 30, all told, for a first-class vessel.

The whole service is under the direction of the Secretary of the Treasury, and its affairs are conducted by a division of his office, in charge of a chief termed Chief of Revenue Marine, whose responsible duties demand from him good executive ability, legal and scholarly attainments, and good business capacity, while he can avail himself of professional advice from any one of the several competent officers of the service in regard to all nautical matters appertaining to the vessels or the *personnel* of the service.

The general discipline throughout the service is similar to that of the navy.

The revenue marine holds a well-earned and deserved popularity, and is generally recognized as a branch of the public service which increases the receipts of the Treasury, and saves to the commerce of the country each year many times more than the annual expenses for its maintenance.—*J. H. Merryman, Captain U.S.R.M.*

Revenue-cutter. Originally, a sharp-built, single-masted, fast-sailing vessel, armed for the purpose of preventing smuggling, and enforcing the custom-house regulations. The name is now applied to the small steamers of the revenue service.

Reverse-valve. A small conical-faced valve attached to a steam-boiler and so arranged as to open inward and admit air when the atmospheric pressure exceeds that of the steam or vapor within, thus preventing external pressure for which the boiler is not braced. A partial vacuum in a boiler may occur when steam of atmospheric pressure is no longer formed by the fires, and when, with dead or hauled fires, it is permitted to condense while the safety-valve and other atmospheric communications are closed.

Reversing-gear. The mechanism attached to the valve-gear of a steam-engine by which the motion of the engine is reversed. In heavy machinery it is actuated by a steam-cylinder controlled by a screw or hydraulic apparatus.

Reversing-lever. A lever or bar by which the motion of a machine is reversed in direction; as, the reversing lever of a locomotive-engine, which throws either the go-ahead or backing eccentrics of the valve-gear into action, causing the engine to move forward or backward.

Revolution. The time occupied by a planet in passing once around the sun is the time of its *sidereal* revolution; as it cannot be observed from the earth on account of the earth's motion, its length can only be computed. A *synodic* revolution is completed when the planet, the earth, and the sun come again into the same relative positions, as, into conjunction, or opposition.

Reynolds, William, Rear-Admiral U.S.N. Appointed acting midshipman, from Lancaster, Pa., November 17, 1831; first cruise, schooner "Boxer," sloop-of-war "Peacock," coast of Africa, Brazil, East Indies, 1831–34; frigate "Potomac," "Delaware," 74, Mediterranean, 1834–36; Naval School, Norfolk, 1836–37.

Promoted to passed midshipman, June, 1837; "Pennsylvania," 120, Philadelphia to Norfolk, 1837–38; Depot of Charts, Washington, 1838; Exploring Expedition, 1838–42.

Commissioned as lieutenant, September, 1841; frigate "Cumberland," Mediterranean, 1843–44; corvette "Plymouth," Mediterranean, 1845; steamer "Alleghany," "Pittsburgh," Mississippi River, Gulf of Mexico, Brazil, Mediterranean, 1846–49; Bureau of Construction, 1850; invalided, 1850; command of store-ship "Fredonia," Valparaiso, 1855; retired, 1855; naval storekeeper, Honolulu, 1857–61; under surgical treatment, 1861–62.

Commissioned as commander, reserved list, 1862; command of "Vermont," Port Royal, November, 1862; of "New Hampshire," and naval depot, Port Royal, 1863–65; restored to active list, February, 1866; command of "Lackawanna," North Pacific, 1866–69.

Commissioned as captain, July, 1866.

Commissioned as commodore, June, 1870; Chief of Bureau of Equipment, July, 1870–75.

Commissioned as rear-admiral, December, 1873; command of Asiatic Station, flag-ship "Tennessee," April, 1875–77; invalided, August, 1877; retired, December, 1877; died, November 5, 1879.

Rhe. A very old word signifying an overflow of water.

Rhind, Alexander Colden, Commodore U.S.N. Born in New York. Appointed from Alabama, September 3, 1838; attached to line-of-battle ship "Ohio" and sloop "Cyane," Mediterranean, 1839–41; sloop "Warren," West Indies, 1842–43; frigate "Macedonian," coast of Africa, 1843–44; Naval School, Philadelphia, 1844–45.

Promoted to passed midshipman, July 2, 1845; brig "Washington," coast survey, 1845–46; Home Squadron, coast of Mexico, until end of the war; present at Alvarado and Tabasco; steamer "Water-Witch," Home Squadron, 1848; coast survey, schooner "Ewing," to California, 1849–50; sloop "St. Mary's," East Indies, 1850–51; coast survey, 1851–54.

Promoted to master, April 30, 1853.

Commissioned as lieutenant, February 17, 1854; sloop "John Adams," Pacific Squadron, 1855; sloop "Constellation," coast of Africa, 1859–61; commanding steam-gunboat "Crusader," South Atlantic Blockading Squadron, 1862; participated in various small affairs at North Edisto; shore fight at Seabrook's plantation, S. C., the crew of the "Crusader" defeating a rebel mounted force; capture and destruction of rebel works commanding South Edisto, Dawho and Pon-Pon Rivers, for which he received the thanks of the Department.

Commissioned as lieutenant-commander, July 16, 1862; commanding steamer "Seneca," South Atlantic Blockading Squadron, 1862; commanding ironclad steamer "Keokuk," South Atlantic Blockading Squadron, 1862–63; commanding her in the attack on defenses of Charleston, April 17, 1863. In this engagement the "Keokuk" was struck 90 times in 30 minutes; 19 shots pierced her through, at and just below the water-line. Finding it impossible to keep his vessel afloat under such an extraordinary fire, Commander Rhind withdrew from action. Being in smooth water he managed to keep her afloat during the night, although the water was pouring into her in many places; but at 7.30 A.M. on the following morning she went down; the officers and crew were saved, but lost all their effects.

Commissioned as commander, January 2, 1863; commanded steamer "Paul Jones," South Atlantic Blockading Squadron, 1863, and took part in various engagements with Fort Wagner and other defenses of Charleston; commanded steam-frigate "Wabash," flag-ship South Atlantic Blockading Squadron, 1863; commanding steam-gunboat "Agawam," North Atlantic Blockading Squadron, 1864–65, and on duty in James River from May to October, 1864. Engagement with rebel batteries at Deep Bottom, August 13, 1864. Rear-Admiral Lee, in his report of this affair, thus speaks of Commander Rhind: "I take great pleasure in calling the attention of the Department to the gallantry and endurance displayed by Commander Rhind of the 'Agawam,' and the officers and men under his command, in the engagement with three rebel batteries, August 13, 1864, reported to the Department by Capt. Smith, divisional commander on the James River." Commander Rhind received thanks of the Department in letter dated September 7, 1864. In December, 1864, Commander Rhind was detailed by Admiral Porter to command the powder-boat "Louisiana," and on the night of the 23d that vessel was exploded within 250 yards of Fort Fisher, the officers and men being taken off by the steamer "Wilderness." Rear-Admiral Porter, in his official report to the Navy Department, says, "In conclusion, allow me to draw your attention to Commander Rhind and Lieut. Preston. They engaged in the most perilous adventure that was, perhaps, ever undertaken. As an incentive to others I beg leave to recommend them for promotion." Commanding receiving-ship "Vermont," New York, 1866–67; commanding naval rendezvous, New York, 1868; navy-yard, New York, 1869–70.

Commissioned as captain, 1870; commanding "Congress" (second-rate), European Station, 1872–73; light-house inspector, 1876–78.

Commissioned as commodore, September 30, 1876; special duty, 1879; president Board of Inspection, 1880.

Rhodes is the capital of the island of Rhodes, in Asiatic Turkey, and is situated at the northeast extremity of the island, in lat. 36° 26′ 9″ N., lon. 28° 13′ E. It is inclosed by walls, and on the land side is strengthened by ravelins and a moat. On the northeast side two piers projecting form a harbor, and on the north side is another port. Outside of the walls, on the north, are the pasha's palace and the dock-yard. It exports red leather and shoes, which form its principal manufacturing industry. Pop. 20,000.

Rhodian Laws. A maritime code, asserted, but without sufficient proof, to be the basis of the Roman sea-laws. The code published by Leunclavius and others, as a body of Rhodian laws, is a mere forgery of modern times.

Rhodings. The brass cleats on which the axles of the pumps work.

Rhumb. The intersection of a vertical circle with the horizon; a rhumb-line.

RHUMB-LINE. A line which cuts the meridians at a constant angle; the loxodromic curve; the equiangular spiral.

RHUMB SAILING. In rhumb sailing, the ship sails on the rhumb-line joining the place of departure and place of destination. It is the ordinary mode adopted when out of sight of land, as the compass points it out, and on Mercator's chart it appears as a straight line.

Rhydal. A ford or channel joining lakes or broad waters.

Rib. A figurative term for one of the frames of a ship, arising from the comparison of a ship stripped of her planking to the human skeleton. A projection formed upon a metal casting for the purpose of securing strength. *Ribs and trucks*, fragments.

Ribadoquin. A powerful cross-bow for throwing long darts. Also, an old piece of ordnance throwing a ball of one or two pounds.

Ribband. A long piece of oak or pine from 4 to 6 inches square, used to keep the frames in position, after they have been regulated.

RIBBAND-LINE. The same as a diagonal line

in the body plan, the difference in their application being that the ribband-line is taken off by the use of horizontal lines square from the centre-line at the intersection of the frame-line with the diagonal line; while the diagonal line is taken off in a diagonal direction, before the line is applied to the half-breadth to obtain its shape. The diagonal lines cannot be used to prove the cant-lines or frames, while the ribband-lines can be so used.

RIBBAND-SHORE. A shore placed against the ribband upon the frames in order to keep the body in shape.

Ribbing-nail. A nail with a large round head to be driven through a ring.

Ribbon-fish (*Tænioidæ*, from *tænia*, a tape-worm). A family of acanthopterous fishes, so called on account of their compressed and elongated form. They are of very delicate structure, in consequence of which it is difficult to obtain perfect specimens. They have a silvery skin, a long dorsal fin often uniting with the tail-fin, a small mouth, and a protractile snout. They are widely distributed, but, being deep-sea fishes, are nowhere found in abundance.

Ribbons. Narrow-painted streaks on a ship's side. The tatters of a sail blown away.

Richmond, the capital of Virginia, and a port of entry, is situated on the north bank of the James River, at the head of tide-water, in lat. 37° 32′ 17″ N., lon. 77° 27′ 28″ W. There are regular lines of steamers to New York, Philadelphia, and Baltimore, and it has admirable railroad facilities. Vessels drawing 16 feet of water can come to Rocketts, at the lower end of the city; the dockage capacity is large. The James River and Kanawha Canal extends from Richmond to Buchanan, a distance of 210 miles. There are 523 manufacturing establishments in the city, embracing 43 plug- and smoking-tobacco factories, 40 cigar-factories, flour- and paper-mills, etc. Pop. 75,000.

Rickers. Lengths of stout poles cut up for the purpose of stowing flax, hemp, and the like. Spars supplied for boats' masts and yards, boat-hook staves, etc.

Ricochet. See FIRE.

Riddle. A kind of weir.

Ride. To lie at anchor; to be supported on the water. A rope *rides* when the part on which the strain is brought lies over and jams the other parts. *To ride down*, to force anything, as a yard, or bunt of a sail, down to its proper place by throwing the weight upon it.

RIDING-BITTS. The bitts to which the cables are secured.

Riders. Interior ribs, to strengthen and bind the parts of a ship together; they are fayed upon the inside planking and bolted through all, and are placed where they are most needed, either at the bow or the stern of the ship. Also, the upper tiers of casks.

Ridge-rope. The centre-rope of an awning. The rope to which the edges of an awning are hauled out.

Rifle. See ORDNANCE.

Rig. The disposition of the masts and yards, the cut of the sails, and manner in which spars, sails, and rigging are fitted. To fit the shrouds, stays, braces, etc., to their respective masts, yards, etc. To cod; to play a sportive trick upon. *To rig out* (or *in*), to run a boom out (or in).

RIGGERS. Men employed in navy-yards to fit the rigging of all ships before being put in commission.

RIGGING. A general name for all ropes or chains employed to support and work masts, yards, sails, etc. *Standing rigging*, rigging set up permanently, as stays, backstays, bobstays, shrouds, etc. *Running rigging*, the ropes which are hauled upon from time to time, in order to adjust the yards, sails, etc.

RIGGING-LOFT. A large room where rigging is stretched, cut, served, etc., in readiness to be sent to ships.

RIGGING-MAT. A heavy mat seized upon the standing rigging to prevent its being chafed.

RIGGING-SCREW. A machine employed to force the two parts of a stiff rope together in order that a seizing may be put on; as, in turning in dead-eyes, forming the eyes of shrouds, etc.

RIGGING-STOPPER. See STOPPER.

Riga, a commercial port of Russia, is situated on the Düna, in lat. 56° 57′ N., and lon. 24° 6′ 30″ E. Along the river on both sides are spacious quays. The inner harbor does not admit vessels drawing more than 15 feet of water; large ships load and unload outside of the bar at the mouth of the river, where is the custom-house. Grain, flax and flaxseed, hemp, wool, hides, tallow, timber, and spars are the chief exports. Pop. 99,000.

Rigel. The star β *Orionis*.

Right. Directly; as, right ahead, right abeam, etc. A ship is said *to right* when she returns to a perpendicular position after having been listed over by the force of the wind. *To right the helm*, to put it amidships.

Right Ascension (Lat. *rectus*, right, straight; *ascensio*, rising). The right ascension of a heavenly body is the arc of the equinoctial intercepted between the first point of Aries and the circle of declination passing through the centre of the body. It is reckoned from the first point of Aries eastward, from 0° to 360°, or from 0 to 24^h. Right ascension and declination are the equinoctial co-ordinates for determining positions on the celestial sphere.

RIGHT ASCENSION, CIRCLES OF. See CIRCLE.

Right-handed Rope. Rope laid up with the sun. See ROPE.

Right Sailing. Running a course on one of the four cardinal points, so as to alter only a ship's latitude, or longitude.

Right Whale. See WHALE.

Rill. A very small run of fresh water, less than a rivulet.

Rimbase. The short cylinder at the junction of the trunnion with the gun.

Rime. Hoar-frost; condensed vapor.

Ring. Anything in the form of a circle. An old brass instrument for measuring altitudes of heavenly bodies, having an aperture in one side, through which a ray entering indicated the altitude on the graduated surface opposite. See SATURN, ANCHOR.

RING-BOLT. A bolt with an eye in one end in which a ring is fitted for convenience in hooking tackles.

RING-DOGS. Iron implements used in hauling timber. They are formed by putting a ring through the eyes of two common dogs.

RING-ROPE. A rope used, in bending a chain, to haul the end of the chain up to the ring of the anchor.

RING-STOPPER. See STOPPER.

Ring-tail. A sail set, like a stun'sail, beyond the leech of a sail spread by a gaff and boom.

RING-TAIL BOOM. A boom extending beyond the spanker-boom or main-boom, to spread a ring-tail.

Rio de Janeiro, the largest and most important city of South America and the capital of Brazil, is situated on the west side of the Bay of Rio de Janeiro, in lat. 22° 54′ 7″ S., lon. 43° 9′ W. Its port, which is large and deep, is defended by a castle. The principal edifices are the palace, the naval and military arsenal, and public hospital. Its imports comprise the product of every country. Its chief exports are cotton, sugar, coffee, rum, gold, diamonds, topazes, amethysts, and aquamarine. The bay is 17 miles long and 11 miles wide, and forms one of the finest harbors in the world. Pop. 275,000.

Rip. A pannier or basket used for carrying fish. See TIDE-RIP.

RIPPERS. Men from the sea-shore, who sell fish to the inland towns and villages.

Riparia. A law-term for the water running between the banks of a river.

Ripary. Inhabiting the sea-shore.

Ripping-iron. A calker's tool for tearing oakum out of a seam, or stripping copper or sheathing from a ship's bottom.

Ripple. The small waves raised on the surface of the water by the passage of a light breeze.

RIPPLE-MARKS. The ripply appearance left at low-water on the flat part of a sandy beach.

Risberm. Fascines placed to oppose the violence of the surf.

Rising. A term derived from the shape of a ship's bottom in general, which gradually narrows or becomes sharper toward the stem and stern-post. On this account it is that the floor of a ship toward the extremities is raised or lifted from a level line, otherwise the shape of the timbers would be so very acute as not to be procurable in wood, or the timber would be so grain-cut as not to be of sufficient strength. Also, the narrow strake just below the thwarts of a boat.

RISING-FLOOR. The floor-timbers forward and aft, on account of the narrowing of the ship's body, are gradually lifted or raised upon the dead-wood or rising-wood, and are known as *rising-floors.* They are difficult to obtain in wood from their acute-angled shape.

RISING-LINE. An elliptical line drawn upon the sheer-plan to determine the sweep of the floor-heads throughout the ship's length.

RISING-SQUARE. A square used in the molding of the ship's frame, upon which is marked the rising of each floor at a sirmark, as well as the half-breadth at the same point to which spots the molds are applied for the molding of the floors.

RISING-WOOD, or DEADWOOD. The wood placed upon the top of the keel at the ends of the ship upon which the cants are secured, where there is so much rise to the floors that it is difficult to obtain timbers to cross the keel. The rising-wood is introduced in order to lessen the expense, and also to continue the framing of the ship to the stem and stern-post. As the ship becomes sharper more rising-wood becomes necessary.

Risks. The casualties against which insurances are made on ships and cargoes.

Rittoch. A name for the tern, *Sterna hirnudo.*

Rive. The sea-shore.

River-risk. A policy of insurance from the docks to the sea.

Rivers. A river is a natural stream of water flowing through the land. Small rivers are called creeks, and still smaller streams are named brooks, rills, and rivulets. The ground through which a river flows is its bed; the deepest part the channel, and the country drained by it is its basin. Rivers have their origin in lakes, from natural springs, and in mountains, some from the melting snows, others issuing from glaciers. Such beginnings are sources, or heads. Rivers empty into the ocean, or into one of its arms, or they stop in some inland lake, flow into some other river, or are lost in desert sands or arid wastes. The final termination of a river is its mouth, and when there are more than one, it is called a delta. Rivers are oceanic; that is, their waters reach the ocean; or they are continental; that is, they are lost in some lake, desert, or waste. Most of the larger rivers are oceanic, but many continental rivers of considerable size exist. A river flowing into another is a tributary, or branch, and rivers are affluents of the bodies into which they empty their waters. Confluent streams are those flowing into the same waters.

Some continental rivers become oceanic after great rains, as the Mareb, in Abyssinia. When a river falls over a gradual descent, such a place is called the rapids, and when the fall is sudden, it becomes a cataract or fall. Many such descents occur and interrupt navigation, more or less, according to their character. The greatest falls are those of the St. Lawrence, at Niagara, the stream, 800 feet wide, here falling over a precipice 165 feet high, and gradually wearing a bed 200 feet deep. The highest fall is found in the Himalaya Mountains. Such rapids and falls (and shoals and rocks) often interrupt navigation in rivers of considerable size. Rivers are usually fresh, but such as have a tidal flow are salt as far as the tide reaches. The tidal-wave, when it meets the current of rivers, sometimes carries a wave called a *bore* to some distance above its mouth. The principal one is in the Amazon. Many rivers flow underground during a part of their course, and some are suddenly lost in the ground. Sometimes rivers lose a part of their waters through narrow connecting channels, known as bayous in Louisiana, and as shats in Persia. Many rivers periodically overflow their banks, as the Ganges, Indus, and Nile.

The following table exhibits the lengths of the chief rivers:

Rivers of the World.

Name.	Miles.	Name.	Miles.
Amazon	4700	Red	2000
Mississippi	3200	Parana	2000
Mississippi and Missouri.	4500	St. Lawrence	2000
Yangtze-Kiang	3300	St. Lawrence proper	600
Nile	3200	Niger	2000
Hoang-Ho	3200	Euphrates	1600
Obi	3000	Danube	1800
Irtish	2000	Apurrimas	1800
Yenesei	2600	Ganges	1800
Tungouska	2300	Rio Grande	1700
Missouri	2200	Indus	1700
Burramapootra	2200	Orinoco	1600
Volga	2200	Platte	1600
Arkansas	2150	Columbia	1506

Name.	Miles.	Name.	Miles.
Dnieper	1300	Rhine	800
Paraguay	1200	Peace	800
Yellowstone	1100	Elbe	700
Kansas	1100	Alabama	600
Mackenzie	1100	Appalachicola	600
Blue Nile	1000	Tagus	600
Ohio	1000	Oder	600
Dwina	1000	Cumberland	600
Don	1000	Susquehanna	500
Senegal	1000	Savannah	500
Magdalena	1000	Rhine	500
Snake	1000	Illinois	500
Gara	1000	Po	450
Tigris	1000	Seine	400
Jumna	900	Connecticut	400
Tennessee	900	Garonne, Delaware, and St. John, each	350
Cauca	800		

A few of these rivers merit an especial mention. The Amazon, also called the Marañon, and, from its discoverer, the Orellana, is formed by the union of the Tunguragua and Ucayale,—the former rising in a lake in Peru, the latter formed by the Apurimac and Payo. It has many islands, some of them 10 miles in circumference, is navigable for 2000 miles, and its mouth is 180 miles wide. The tides extend 400 miles, and the *bore* is 10 to 15 feet high. Besides the branches mentioned, the Napo, Yapara, Negro, Yutay, Madeira, and Xingu, are the chief ones. The Madeira is 1800 miles long. The basin drained by the Amazon embraces 2,400,000 square miles. Its head-waters connect with those of the Orinoco. It was discovered by Vincent Yanez Pinzon in 1500, and Orellana, in 1539, traced its course. It was thoroughly described and explored by Condamine in 1743, and by Humboldt, Lieut. Herndon, and lately by Commander Selfridge, in the "Enterprise."

The Mississippi rises in a small lake (Itasca) in Minnesota, although a dozen other lakes might as easily be named as its source, and flows nearly in a straight line south to the Gulf of Mexico, pouring its waters out through five mouths, called here passes. It has scores of tributaries, four of them at least being large rivers, and a dozen others of some size.

The Yangtze-Kiang and the Hoang-Ho are both large rivers of China. They rise nearly together in the table-lands of Chinese Thibet, the former flowing southeast, the latter northeast, until they are 1000 miles apart, when they turn towards each other, and finally empty their waters into the Yellow Sea, 100 miles apart. The alluvium brought down by these rivers gives the name to the Sen and Yellow Rivers, and has sensibly decreased the depth of the former. The Yangtze-Kiang receives the several names of Minachoo, Ya Loong, Tachoong, Kin Sha, and Ta Kiang, in portions of its course. It has 7 large tributaries, and is navigable for 1000 miles.

The Obi, Yenesei, and Lena are mighty streams, rising in the centre of Asia, and flowing in a northerly direction into the Arctic Ocean. Each has numerous tributaries, and together they water and drain the vast steppes of Siberia. Although deep and wide, these rivers are navigable only a small portion of the year because of the ice. Each drains 1,000,000 square miles of territory.

The other large rivers of Asia, the Ganges, Indus, Burramapootra, and Euphrates, flow through low and marshy districts, and at certain seasons overflow their banks, rendering the lands fertile.

The Nile is one of the most remarkable rivers of the world. Its source, but recently ascertained, is in the Lakes Albert and Victoria Nyanza, in the interior of Africa. It flows nearly north to the Mediterranean, pouring its water through five mouths,—the original *delta*. It receives one large tributary, the Blue Nile, and several smaller ones, but for the last 1300 miles receives none,—a solitary instance of such a lack. It periodically overflows its banks, not only watering an arid valley, but fertilizing it by the quantities of mud there deposited. In its course it traverses the ancient countries of Egypt and Nubia, where still exist gigantic remains of the first civilization of the globe.

The Volga is the largest river of Europe. It rises nearly in the centre of Russia, and empties into the Caspian Sea. During the lower part of its course it has many bayous or canals. The Danube is next, and the Dnieper, Dwina, Don, and Rhine are not far behind it in size and importance.

Arabia and the Great Sahara Desert of Africa are most destitute of rivers, and the whole western coast of South America is without rivers of any size, none of them being navigable.—*F. S. Bassett, Lieutenant U.S.N.*

Rivet. The roe of a fish. A pin or bolt of metal for confining pieces of material together; the ends are enlarged in diameter and formed into heads, projecting over and clasping the outer surfaces of the united pieces by battering or longitudinal compression.

Roach. The curvature of the foot of a sail; the object is to keep the foot from chafing. A gregarious fresh-water fish of the carp family (*Leuciscus rutilus*). It is of a silver-white color, with a greenish back, having the dorsal fin opposite the ventral. It is about a foot in length.

Road, or Roadstead. An off-shore anchorage, affording less protection to vessels than a harbor.

Roader, or Roadster. A term applied to a clumsy vessel which works its way from port to port by means of the tides, anchoring when wind and tide are unfavorable.

Roast Beef Dress (*Eng.*). Full uniform; probably from its resemblance to that of the royal beef-eaters.

Roast Beef of Old England. A popular air by which officers are summoned to the dinner-table.

Robans. Short bits of spun-yarn, foxes, etc., for securing the head of a sail to the jack-stay on the yard.

Rochester, a port of entry in Monroe County, N. Y., is situated on both sides of the Genesee River, in lat. 43° 8′ 17″ N., lon. 77° 51′ W. The city is connected by a net-work of railways with every city of importance in this country and Canada, and it has also two important channels of trade in the Erie and Genesee Valley Canals. The foreign commerce, chiefly carried on by the lakes, although some of it comes by way of New York, is quite large, and its domestic trade is much larger. It is one of the greatest flour-producing cities in the world, and also has extensive manufactories of other kinds. The largest carriage-factory in the United States is located here. There are 16 flour-mills, grinding each year an average of 3,000,000 bushels of wheat. Pop. 82,000.

Rock. *Half-tide rock*, a rock awash at half-tide.

Rock-cod. A species of cod found on a rocky bottom.

Rocket-boat. A flat-bottomed boat fitted with rocket-frames to fire Congreve rockets from in naval bombardment.

Rock-fish. A salt-water fish, a species of goby, *Gobius niger*.

Rock-hind. A large fish of tropical regions, *Serranus catus*.

Rockling. A fish of the genus *Motella* (*M. vulgaris*), belonging to the cod family; whistle-fish.

Rock-scorpion. A name applied to persons born at Gibraltar.

Rock-shaft. In mechanism, a shaft which oscillates about its axis; as, in transmitting the reciprocating motion from the eccentrics to the valves of a steam-engine.

Rodding-time. The season for fish spawning.

Rodgers, C. R. P., Rear-Admiral U.S.N. Born November 14, 1819, in Brooklyn, N. Y. Appointed midshipman from Connecticut, October 5, 1833; attached to frigate "Brandywine" and sloop "Vincennes," Pacific Station, 1834–36; navy-yard, New York, 1837; sloop "Fairfield" and brig "Dolphin," Brazil Squadron, 1837–39.

Promoted to passed midshipman, July 8, 1839; schooner "Flirt," coast of Florida, 1839–40; and in command of schooner "Phœnix," 1841–42, being actively employed in the Seminole war during those three years; sloop "Saratoga," coast of the United States, 1842–43.

Commissioned as lieutenant, September 4, 1844; served in Mediterranean Squadron in frigate "Cumberland," 1843–45, and in store-ship "Lexington," 1845; coast survey, 1846; frigate "Potomac" and sloop "Albany," blockading Mexican coast, 1847; present and in the trenches at the reduction of Vera Cruz and at the capture of Tabasco and Tuspan; coast survey, 1848–49; frigate "Congress," Brazil Squadron, 1850–51; frigate "Constitution," coast of Africa, 1852–55; coast survey, commanding steamer "Bibb" and schooner "Gallatin," 1856–57; steam-frigate "Wabash," Mediterranean Squadron, 1858–59; commandant of midshipmen at Naval Academy, 1860–61.

Commissioned as commander, October 15, 1861; served in steam-frigate "Wabash" as captain and fleet-captain, 1861–63, commanding that ship at the battle of Port Royal, November, 1861, and the naval force in the trenches at the reduction of Fort Pulaski, January 27, 1862. While in the "Wabash," much employed on detached service, in command of a division of gunboats in retaking the coast and inlets of Georgia and Florida, and South Carolina south of Port Royal; fleet-captain in the "New Ironsides" in the attack on Charleston, April 7, 1863. Rear-Admiral Dupont in his official report of that engagement says, "On this, as on all other occasions, I had invaluable assistance from the fleet-captain, C. R. P. Rodgers, who was with me in the pilot-house directing the movements of the squadron. For now over eighteen months in this war this officer has been afloat with me, and in my opinion no language could overstate his services to his country, to this fleet, and to myself as its commander-in-chief." Commanded steam-sloop "Iroquois," 1863–65, on special service.

Commissioned as captain, July 25, 1866; navy-yard, Norfolk, 1865–67; commanded steam-frigate "Franklin," Mediterranean Squadron, 1868–70.

Commissioned as commodore, August 28, 1870; special service in Europe, 1871; chief of Bureau of Yards and Docks, October, 1871–74.

Commissioned as rear-admiral, June 14, 1874; superintendent Naval Academy, 1874–78; commanding Pacific Station, 1878–80.

Rodgers, John, Commodore U.S.N. Born in Hartford County, Md., 1771; died at Philadelphia, August 1, 1838. Entering the navy as a lieutenant, March 9, 1798, he was the executive-officer of the frigate "Constellation," Commodore Truxtun, when she captured the French frigate "L'Insurgente" off Nevis, February 9, 1799, and took possession of the prize. Made a captain March 5, 1799, he cruised in the "Maryland," 20, upon the West India Station; in 1802 he commanded the "John Adams," 28, with which and the "Enterprise," 12, he successfully attacked, in June, 1803, a Tripolitan cruiser of 22 guns, and several gunboats at anchor near Tripoli; in 1804 he commanded the "Congress," 38, in the squadron employed against Tripoli under Commodore Barron, whom, in 1805, he succeeded in the command. After the peace with Tripoli, he proceeded with his squadron to Tunis, where he engaged in negotiations which resulted in the establishment of friendly relations. In the spring of 1811, in the "President," 44, off Annapolis, he heard that a seaman had been impressed off Sandy Hook by an English frigate; sailing for that point without delay, May 16 he hailed, about 8½ P.M., a vessel of war, but received no answer. After a little delay, the stranger hailed, and immediately fired a shot that entered the "President's" mainmast. After a short engagement, in which his opponent was much crippled, he ceased firing, and on the following morning boarded, discovering her to be H.B.M. ship "Little Belt," 22 guns, Capt. Bingham. The accounts given by the two commanders of this affair differed materially, particularly as to the firing of the first gun; and it widened the breach which already existed between the two nations. June 21, 1812, receiving official intelligence of the declaration of war against Great Britain, Commodore Rodgers sailed from New York in command of a squadron; June 23, while chasing the British frigate "Belvidere," during a running fight, a gun burst, killing and wounding 16, Commodore Rodgers being among the latter; in a subsequent cruise he took the British packet "Swallow," with a large amount of specie, and the schooner "Highflyer"; appointed June 14 to the new frigate "Guerriere," he rendered important service in the defense of Baltimore; from April, 1815, to December, 1824, he served as president of the Board of Navy Commissioners; Acting Secretary of the Navy, September to December, 1823; and in 1824–27 in command of the Mediterranean Squadron. On his return he was again on the Board of Navy Commissioners, which position he relinquished in 1837.

Rodgers, John, Rear-Admiral U.S.N. Born in Maryland, and appointed midshipman from District of Columbia, April 18, 1828. Attached to frigate "Constellation," Mediterranean Squadron, 1829–32; Naval School, Norfolk, 1833–34.

Promoted to passed midshipman, June 14, 1834; on leave, 1835; brig "Dolphin," Brazil Squadron, 1836–38; special service, 1839.

Commissioned as lieutenant, January 22, 1840; brig "Boxer," Home Squadron, 1841–43; special service, 1844–45; sloop "Marion," Mediterranean Squadron, 1846–47; coast survey, 1848–52; commanding steamer "John Hancock" and Surveying and Exploring Expeditions to North Pacific and China Seas, 1853–56.

Commissioned as commander, September 14, 1855; special duty, Washington, D. C., 1857–59; waiting orders, 1860.

In 1861, Commander Rodgers was ordered to special duty in the West, superintending the construction of the Benton class of ironclads. In 1862 he was assigned to the command of the ironclad steamer "Galena," and ordered to the North Atlantic Blockading Squadron. On May 10, 1862, Commander Rodgers left Hampton Roads in command of an expedition of gunboats, with orders to enter the James River, and, if possible, to ascend the river to Richmond. After two engagements with rebel batteries, which were in each instance silenced, the fleet reached Fort Darling, a casemated battery erected on the crest of a hill, which, together with sunken vessels, effectually obstructed the channel.

On the morning of May 15, Commander Rodgers anchored the "Galena" in front of and at a distance of 500 yards from the rebel fort. The "Aroostook" and "Port Royal," wooden gunboats, were stationed 800 yards below the flagship. At 8 A.M. the vessels opened fire on Fort Darling, and from that time until 12 M. kept up a vigorous bombardment. At 12.10 P.M., Commander Rodgers having expended every shot and shell in the magazine and shell-room of the "Galena," made signal to withdraw from action, the vessels retiring in good order, and giving the rebels a parting shot as they steamed down the river. The monitor being unable to give sufficient elevation to her guns, and the "Naugatuck," better known as the Stevens battery, having burst her rifle-gun at the first fire, were rendered useless so far as the fort was concerned, although both vessels did good service during the action by stationing their crews as sharpshooters and picking off the rebel riflemen who greatly annoyed the crews of the wooden vessels.

The armor of the "Galena" did not prove of any service to her. She was hit 129 times, losing in killed and wounded two-thirds of her crew. The "Aroostook" and "Port Royal" suffered to a less extent.

Commissioned as captain, July 16, 1862.

In 1863, Capt. Rodgers was ordered to the command of the monitor "Weehawken," and sailed from New York in that vessel for the South Atlantic Blockading Squadron. On his way South, and while off the Delaware Breakwater, he encountered a heavy gale. He was urged to run in and remain until the storm abated. This he declined to do, saying he wished to test the sea-going qualities of the monitors. The "Weehawken" rode out the gale and reached Port Royal in safety.

On June 17, 1863, in Warsaw Sound, Ga., Capt. Rodgers, in the "Weehawken," encountered the powerful rebel ironclad "Atlanta," a vessel of much greater tonnage than the "Weehawken." So confident were the rebels of a speedy victory, that the "Atlanta" was accompanied from Savannah to the scene of action by boats freighted with gay parties eager to witness the triumph of their vessel. Five shots were fired by the "Weehawken." The fight lasted but 15 minutes, at the end of which time the "Atlanta" surrendered. An important feature of this conflict was the final settlement of the dispute as to the value of the new 15-inch gun, which fully proved its merit.

Commissioned as commodore, June 17, 1863; commanding ironclad "Dictator," special service, 1864–65; commanded monitor "Monadnock," 1866–67; and in that vessel made the passage around the Horn to San Francisco. Commodore Rodgers touched at Valparaiso, and witnessed the bombardment of that place by the Spanish fleet.

Commanding navy-yard, Boston, 1867–69.

Commissioned as rear-admiral, December 31, 1869; commanding Asiatic Fleet, 1870–72; commandant Mare Island Navy-Yard, 1873–77; superintendent Naval Observatory since May 1, 1877.

Rodman Gun. See ORDNANCE.

Rodney, George Brydges, Lord, was the son of Capt. Rodney, who having won the favor of George I. as the commander of the royal yachts, the king gave his son a "letter of service," and at the early age of 12 he went to sea. In 1739 he was promoted to lieutenant; post-captain in 1742, and commander of the Newfoundland Station, with the rank of commodore, in 1748. In 1752 he returned home, and was elected a member of Parliament. He afterwards commanded the "Fouguex," the "Prince George," and the "Dublin" men-of-war. In 1759 he was promoted to rear-admiral. In July of that year he bombarded Havre for 3 days, destroying the town and fortifications. In 1761 he took Martinique, Grenada, and Santa Lucia. In 1762 he became vice-admiral, and in 1764 was made a baronet. In 1779 Spain and France joined in war against England. The siege of Gibraltar was undertaken, and Rodney was ordered to the West India Station with 22 sail of the line and 8 frigates, and was also ordered to relieve Gibraltar *en route.* After capturing 7 Spanish ships of war he fell in, January 16, 1780, with Admiral Langura off Cape St. Vincent. Of the Spanish fleet 5 were captured and 2 destroyed. After this action he sailed for the station of his command, and on the 17th of April he defeated, near Martinique, the French fleet under the Count de Guichen. After this Rodney took Eustatia from the Dutch, with 250 ships and other booty. Demerara and Essequibo next surrendered. On April 12, 1782, together with Hood and Drake, he encountered the French fleet under De Grasse off Dominica. Each fleet consisted of 30 ships of the line. The fight lasted 12 hours, when De Grasse retired totally defeated. The English loss was 7 ships and 2 frigates, and 600 men, while the French casualties were 3000 killed, 6000 wounded, and a train of artillery besides their ships. Count De Grasse was himself taken prisoner. For this great victory, which saved Jamaica, ruined the naval power of Spain and France, and gave the finishing blow to the war, Rodney was elevated to the peerage as Baron Rodney, and received a pension

of £2000 per annum for himself and his successors. He lived in retirement the rest of his life, and died May 21, 1792.

Roger. The black flag hoisted by pirates.

Roger's Blast. A sudden and local motion of the air resembling a whirlwind.

Rogue's March. The tune appropriated to drumming a bad character out of a ship or out of a regiment.

Rogue's Yarn. A yarn which differs from the other yarns in a rope. It is twisted the contrary way, or is different in color or material. The object is to detect the theft of government rope.

Roll. The oscillating movement of a ship caused by the seas striking on her side. Under the same circumstances of wind and sea the roll depends on the position of the centre of gravity, the construction of the ship, and the amount and kind of sail carried. If the centre of gravity is too low, the roll is short and jerky, and there is danger of carrying away the masts; if too high, there is danger of capsizing; if in the proper place, the roll is long and deep, but easy, the ship coming to her bearings gradually.

ROLLING-CHOCKS. The jaw-pieces fitted to a yard.

ROLLING-ROPE. A rope used on a light yard to support it in heavy rolling. See ROLLING-TACKLE.

ROLLING-TACKLE. A tackle from the quarter of a lower or topsail yard to the mast, to steady the yards in heavy rolling. It is also used on the opposite quarter of the yard in taking in a heavy weight, to take up a portion of the thrusting strain. With jaws or patent trusses rolling-tackles are seldom used.

Roller. A heavy oceanic swell setting in upon the coast. In mechanism, a piece having a circular transverse section, placed between a moving and a fixed body to avoid sliding contact and its consequent friction. It may have the form of either a cylinder, cone, or sphere. Cylindrical rollers are used for motion in a plane perpendicular to their axes; and conical or spherical rollers for angular motions, as in receiving the axial thrust of a shaft.

ROLLING-SWELL. That heaving of the sea where the waves are very distant, forming deep troughs between.

Roman Cement. A cement which hardens under water; used for piers, docks, etc.

Rombowline. See RUMBOWLINE.

Ronckendorff, William, Commodore U.S.N. Born in Pennsylvania. Appointed from Pennsylvania, February 17, 1832; attached to the schooner "Experiment," on the coast, and transferred to the schooner "Porpoise," West India Squadron, 1832–33; frigate "Constitution" and sloop "John Adams," Mediterranean Squadron, 1835–37.

Promoted to passed midshipman, June 23, 1838; brig "Consort," coast survey, 1839–41; sloop "Preble," Mediterranean Squadron, 1842–43.

Commissioned as lieutenant, June 18, 1843; frigate "Congress," Brazil Squadron, 1843–45; 1845, bearer of dispatches, by the way of the Isthmus of Panama, to the commander-in-chief of the Pacific Squadron, and served in that squadron during the Mexican war, returning to New York from that station in the frigate "Savannah," September, 1847; sloop "Portsmouth," coast of Africa, 1849–51; receiving-ship, New York, 1852; frigate "Cumberland," Mediterranean Squadron, 1852–55; navy-yard, Philadelphia, 1855–58; commanding steamer "M. W. Chapin," Brazil Squadron and Paraguay Expedition, 1859; attached to coast survey, 1860.

Commissioned as commander, June 29, 1861; on February 28, 1861, Commander Ronckendorff was ordered to take command of the steamer "Water-Witch," and proceeded to the Gulf Squadron, on special service, until October 12, 1861, at which date he was detached and ordered to proceed North as bearer of important dispatches to the Hon. Secretary of the Navy, from Flag-Officer McKean; December 27, 1861, ordered to the steam-sloop "San Jacinto," and on March 4, 1862, ordered to proceed with that vessel in search of the ship-of-the-line "Vermont," supposed to be on George's Shoals; March 8, returned to Boston Navy-Yard, and on the following day ordered to proceed to Hampton Roads with the "San Jacinto," with greatest dispatch, and report to the senior officer present, to watch and attack, if necessary, the Confederate steamer "Merrimac"; May 15, 1862, participated in the attack on the fortifications on Sewell's Point; May 18, 1862, proceeded to Norfolk with the "San Jacinto"; May 23, 1862, sailed from Hampton Roads to Key West with Flag-Officer Lardner on board; August 1, 1862, returned North with the "San Jacinto," by order of flag-officer,—having yellow fever on board; September 29, 1862, ordered to join the North Atlantic Squadron with the "San Jacinto," and to proceed off Wilmington, N. C.,—blockading; October 9, 1862, ordered to return from Wilmington with the "San Jacinto" to Hampton Roads; October 26, 1862, ordered to proceed in the "San Jacinto" to Bermuda, and cruise among the West India Islands in search of the rebel steamer "Alabama"; May 26, 1863, detached from the "San Jacinto," and reported for the command of the steam-sloop "Ticonderoga"; May 28, 1863, ordered to the West Indies, in the "Ticonderoga," as flag-ship of that squadron, under Rear-Admiral Lardner, to look after the rebel cruisers; September 28, 1863, ordered to Philadelphia in the "Ticonderoga" for repairs; October 16, 1863, detached from the "Ticonderoga" and ordered to the command of the frigate "Powhatan," and to proceed to the West Indies as flag-ship of that squadron; October 14, 1864, detached from the command of the "Powhatan,"—she having returned home; October 18, 1864, ordered to report to Rear-Admiral Gregory, at New York, for special duty; was ordered West on a court of inquiry, held at Erie, Chicago, Cincinnati, Louisville, Ky., and then returned to Philadelphia; February 15, 1865, ordered to command the ironclad "Monadnock," up the James River,—was there until the evacuation of Richmond,—came down the river and anchored off Fortress Monroe to look out for the "Stonewall"; in May, sailed in the "Monadnock," in a squadron commanded by Admiral Godon, to Havana, in search of the "Stonewall"; July 9, 1865, transferred from the ironclad "Monadnock" to the ironclad "Tonawanda," and, after a short cruise in her, was detached, she being laid up, and ordered to command the receiving-ship at Philadelphia, January 1, 1866; Commander Roncken-

dorff was actively employed during the whole period of the Rebellion; in charge of ironclads, New Orleans, 1871–72.

Commissioned as commodore, 1873. Retired November 9, 1874.

Rood-goose. A name for the brent-goose.

Rooke, Sir George, a distinguished British admiral, was born in 1650, near Canterbury. At the age of 30 he was a post-captain, and in 1689 was promoted to rear-admiral. He was engaged in the action off Beachy Head, between the Earl of Torrington and the French Admiral De Tourville, and in 1692 he took part in the memorable battle of La Hogue. On this occasion, for his dashing and brilliant services, he received the rank of vice-admiral of the red, the honor of knighthood, and a pension of £1000 per year. His next service of importance was the destruction of a Spanish plate fleet in the port of Vigo; and in July, 1704, in conjunction with Sir Cloudesley Shovel, he captured Gibraltar. On August 9 of the same year he fought off Malaga a vastly superior French fleet under the Comte de Toulouse, and although the English fleet won the battle, the victory was a barren one, as the French fleet escaped. Upon Sir George's return he was received with marked distinction by Queen Anne; but the government being hostile to him, he resigned his positions, and until his death on the 24th of January, 1709, he lived in retirement on the family property in Kent.

Rooke, or Rouke. A mist, dampness, or fog.

Room, Roomer, or Going Room. An old term for going large. *To go room*, to bear up.

Room and Space. The space occupied by each frame of the ship, or the distance of the frames from centre to centre.

Roost. A phrase applied to races of strong and furious tides which set in between the Orkney and Shetland Islands, as those of Sumburgh and the start.

Rope. "A large stout twisted cord of not less, usually, than an inch in circumference. It differs from cord, line, and string only in its size." (Webster.)

The different kinds of rope are designated by the material of which they are made, by the peculiarities of their manufacture, by their sizes, number of strands of which they are composed, and by the various uses to which they may be adapted.

Plain-laid rope is made by laying three strands together right-handed, or from left to right.

Cable- or *hawser-laid rope* consists of 9 strands, and is made by laying 3 plain-laid ropes together left-handed, or from right to left.

Cable-laid stay consists of 12 strands or 4 plain-laid ropes, closed as above, to form a single rope.

Shroud-laid rope is made by laying 4 strands together right-handed, and takes its name from the use to which it is generally applied. It is usually made with a heart to fill up the space in the centre of the strands, which assists in keeping them in place when subjected to a heavy strain.

Back-handed rope is made by twisting each strand right-handed, or in the same direction as the yarns, and laying the strands together left-handed.

The materials from which rope is principally manufactured are hemp, or the fibre of the cultivated hemp plant, abaca, or manilla, which is the fibre obtained from a species of banana found in large quantities in the Philippine Islands, hide, and wire.

In some localities, rope of an inferior quality is made from cotton, coir, or the fibre obtained from the cocoa-nut palm, and jute, which resembles hemp, but has less strength and durability.

The hemp used for rope in the United States is principally of native growth or imported from Russia. An article of superior value is produced in Italy, but it is less used for the manufacture of cordage than for other purposes. The quality of the fibre varies considerably with the climate and soil in which it is raised, experiments showing that the average breaking strain of rope-yarns No. 20 for a strand of 3-inch rope, made from the different kinds of hemp, are as follows: Italian, 157 pounds; Russian, 153 pounds; American, 141.5 pounds.

The fibre is prepared for use by a process called *retting* or *rotting*, which consists in placing the stalks in water until fermentation takes place. By this means the glutinous matter which binds the fibre to the woody portion of the stalk is set free. The same result is sometimes obtained by exposing the stalks to dew and rain, and the process is then called *dew-rotting*, but a longer time is required than by the former method.

The stalks, having been rotted and dried, undergo the process of *breaking*, by which they are cracked by repeated blows, and the brittle, woody portion separated from the fibre, which falls away when beaten with a broad wooden blade in the process of *scutching*.

The hemp is further prepared for spinning by the operation of *hackling*, which consists of drawing a bunch of the fibre through a set of long, sharp steel points placed in an upright position, for the purpose of straightening it and removing the tow, or shorter fibre of less value, and dust. The tow which is thus separated is sometimes used in the manufacture of inferior qualities of rope.

Hackling is also done by means of a machine consisting of a revolving drum armed upon its surface with steel points, which, gradually increasing in length, separate the tow from the more valuable fibre.

The hackled hemp is then passed through the spreader, by which it is again combed and straightened by the teeth attached to the endless chain of hackle-bars, and leaves this machine in a loose strand of fibre called a roping or sliver. Several of these ropings are then subjected to a similar operation in a machine called the drawing-frame, by which they are formed into a smoother and more regular roping of the size required for spinning the yarn. The ropings, which coil themselves into large tin boxes or cylinders as they come from the drawing-frames, are then taken to the jennies for spinning.

The spinning-jenny consists of an iron frame of rectangular shape, about 12 feet long and 4 feet high, and varying in width from 2 to 3 feet. The roping is drawn from its box, which is placed at the end of the jenny, by an endless chain of gill-bars, and carried to the mouth-piece, a flat metallic plate placed in an upright position.

Connected with the mouth-piece is an attachment for regulating, automatically, the speed of the gill-bars according to the size of the roping, so as to make a yarn of uniform size. The rop-

ing next passes between two calender rollers, tongued and grooved, and lastly through the flyer, by which it is twisted, and is wound upon the bobbin placed between the arms of the flyer.

The yarns next undergo the process of tarring by placing a number of the bobbins in frames at one end of the tarring-room, and leading the yarns through a guide-plate into a large trough filled with tar heated to a temperature of about 200° F. The yarns, after leaving the tar, pass through holes in another plate, by which the tar is scraped off, and from thence between nipper-rollers, which presses them dry, and are wound upon bobbins at the other end of the tarring-room ready for the final processes of the rope-walk.

The bobbins are again placed in upright frames at the end of the rope-walk, the ends of as many yarns as are required to form the strand are passed through the register-tube into which they fit closely, and are fastened to one of the hooks on the face of the hauling-down machine. This machine runs upon a track the length of the rope-walk. The same band by which it is propelled carries the machinery for turning the hooks to which the strands are attached, and the machine, traveling away from the bobbins, draws the yarns through the register-tube and twists them into strands.

The laying of the strands is performed by two machines called the upper and lower layers, the former traveling on a track as required, and the latter being stationary. Each strand is attached to a separate hook on the lower layer, and all of the strands for the same rope are fastened to the same spindle on the upper layer, each strand being twisted while the rope is laid by the upper layer. A wooden frame called the top-sled travels on tracks overhead, and supports a conical instrument called a top, which is placed between the strands at the point of meeting, and serves to keep them in place by laying them in the grooves on its surface, as well as to regulate the hardness of the lay. Its progress, caused by the pressure of the strands in laying, is retarded by means of stoppers or tails, which are passed around the rope between the top and upper layer.

The estimated loss in the strength of the fibre in spinning, twisting, and laying is 25 per cent., while 33 per cent. of the length is lost in the same operation.

Ropes of the smaller sizes are also made by the use of the "Woodward laying machine," which both twists the strands and lays the rope.

Small-stuff, such as marline, houseline, spun-yarn, etc., is generally made from American hemp by the process of hand-spinning.

The manufacture of rope from abaca, or manilla, differs only in the preparation of the fibre before it is spun. Rotting is not required as in the preparation of hemp fibre, but the leaf-stalks having been torn into strips, the fibre is separated from the pulp. The coarser qualities of the fibre, which are best fitted for rope, are taken from the outside layer of the stalk.

Before passing through the spreader the manilla fibre is oiled, but no tar is used except in the making of large cables, when the outside yarns of each strand are sometimes tarred.

Hides are prepared while in a green state, by being cut into strips of regular width on a revolving table, and the strips are then formed into strands and laid into rope by the processes already described.

Wire rope is used to a great extent both on shore and on shipboard, where strength and durability are required, rather than flexibility. It is made from steel or iron wire. Plain steel wire is about 56 per cent. stronger than plain iron wire, and 65 per cent. stronger than annealed iron wire. The process of annealing renders the wire less brittle and better suited for some purposes on shipboard. Both steel and iron wire may be galvanized, and this process does not detract from its strength. Small sizes of rope made from copper wire are used for lightning-conductors.

All machinery for the manufacture of wire rope is of the same general construction, but the machines are lighter or heavier, according to the size of the rope required. They consist of two parallel iron rings several feet apart, through the centres of which passes an upright shaft, connected at their peripheries by several movable iron frames, which hold the wire bobbins, the whole resembling a frame-work of cylindrical shape placed in an upright position. The bobbin-frames are connected with the central shaft by gearing in such a manner that while the cylinder revolves about the shaft, carrying the bobbins with it, a reverse motion is given to the bobbin-frames, which prevents the twisting and consequent injury to the wire. The wires meet above the cylinder, and form the strand by being twisted about a heart of small hemp line, which passes over a pulley down to the reel upon which it is wound. The process of laying the rope is the same as that of forming the strand.

The following rules for finding the breaking strain of rope manufactured at the navy-yard, Boston, has been furnished by Mr M. H. Webber, superintendent of the rope-walk:

Untarred hemp rope, square of circumference in inches × 1371.4 = strength in pounds.
Tarred hemp rope, square of circumference in inches × 1044.9 = strength in pounds.
Manilla hemp rope, square of circumference in inches × 783.7 = strength in pounds.
Steel wire rope, weight in pounds per fathom × 7098 = strength in pounds.
Charcoal wire rope, weight in pounds per fathom × 4480 = strength in pounds.

—*E. T Strong, Lieutenant U.S.N.*

Rope-walk. A long building or room where rope is manufactured. It is so called from the walking back and forth of the workmen in the operation of hand-spinning.

It is distinguished from manufactories called "cordage works," in which a different kind of machinery is used, and which do not require buildings of great length.

Connected with the rope-walk are rooms or buildings where the fibre in bales is received and hackled, where the fibre is made into ropings, and where the ropings are spun into yarns. There are also rooms for oiling, tarring, hand-spinning, etc.

Upon the floor of the rope-walk are placed the tracks for the machines used in twisting the strands and laying the rope. String-posts are placed at intervals near the tracks, from each of which a wooden arm extends several feet in length, and upon which the strands are placed after being completed. The strands are kept in

place by means of wooden pegs inserted in the upper surface of the arms.—*E. T. Strong, Lieutenant U.S.N.*

Rope's-end. The end of a rope. *To rope's-end*, to administer a drubbing with the end of a rope.

Rorqual, or Furrowed Whale. A name of Scandinavian origin applied to the finback whales, distinguished from the right-whales by the small size of their heads, shortness of their whalebone, the presence of a dorsal fin, and of a series of conspicuous longitudinal folds or furrows in the skin of the throat and chest.

Rose. An attachment to a pipe, spout, or hose-nozzle, by which a stream of water is scattered into drops or spray by passing through a perforated plate or cap.

Rose-lashing, or Rose-seizing. A lashing or seizing in which the parts are passed alternately over and under, the end being expended around the crossing.

Rosina. A Tuscan gold coin, value about $4.10.

Ross, Sir James Clark, was born in London in 1800. He entered the navy in 1812, and served under his uncle (Sir John) in the Baltic, the White Sea, the coast of Scotland, and in all the expeditions for the discovery of the northwest passage. It was while on his second Arctic voyage that he discovered, in 1831, the north magnetic pole, and on his return he was rewarded with a post-captaincy. In 1836 he crossed the Atlantic to relieve the frozen whalers in Baffin's Bay, and in 1839 he was placed in command of the Antarctic Expedition, and approached within 160 miles of the south magnetic pole. In 1843 he received the honor of knighthood. In 1848 he made a voyage to Baffin's Bay in search of Sir John Franklin, but without success. He received a number of medals, and was made a D.C.L. of Oxford. He died in 1862.

Ross, Sir John, C.B., was born June 24, 1777, at Balsarrock, Wigtonshire. He entered the navy in 1787; was promoted to lieutenant in 1802, commander in 1809, and post-captain in 1818. While a lieutenant he was wounded in cutting out a Spanish vessel from under the batteries of Bilboa, in 1806. His more important services were rendered in the Arctic regions in 1818, with Sir W. G. Parry. In May, 1829, he was employed on a fresh expedition fitted out by Sir Felix Booth, and on this expedition he discovered the peninsula of Boothia Felix, and upon his return he received the honor of knighthood, and was made C.B. In 1838 he was appointed British consul at Stockholm, where he remained some years. He became a rear-admiral in 1851, and died August 30, 1856.

Rostock, a city of Germany, in Mecklenburg-Schwerin, on the Warnow, 9 miles from its mouth in the Baltic, in lat. 54° 5′ N., lon. 10° 14′ E. It has numerous manufactories of woolen cloth, soap, and chiccory, extensive breweries, distilleries, and sugar-refineries. Its trade is extensive; the exports consist principally of superior red wheat, barley, pease, rape-seed, oats, wool, horses, cattle, and provisions, and the imports are colonial produce, wines, and manufactured goods. Vessels drawing more than 9 feet of water unload at Warnemünde, its outport. Pop. 35,000.

Rostral-crown. The naval crown anciently awarded to the individual who first boarded an enemy's ship.

Rostrum. The prow of a galley.

Rotary Blower, or Fan. A machine in which a current or blast of air is induced by the motion of vanes, blades, or fans inclosed in a suitable case provided with supply and discharge openings, and secured by radial arms to a revolving shaft so as to present their broadsides in the direction of their motion. In the ordinary fan-blower, the action depends upon the centrifugal force of the air induced by rapid revolution; and in some devices, the vanes or plates act as pistons passing round a segment of an annular space between two cylinders.

Rotary Pump. A pump by which water is thrown by the action of a rectangular piston rotating round a cylinder on an axis parallel to one of its sides and to the axis of the cylinder, though not coincident therewith. There are numerous varieties.

Centrifugal pumps, by which water is thrown by the centrifugal action of rapidly revolving *vanes*, are sometimes called *rotary pumps.*

Rotary Steam-engine. A steam-engine in which the steam acts upon a rectangular piston rotating round a cylinder on an axis parallel to one of its sides and to the axis of the cylinder, though not coincident therewith. This form of engine, of which there are many varieties, is not in general use, owing principally to the impracticability of making the piston and valves steam-tight.

Rotary Valve. A valve which, in rotating about its axis, alternately opens and closes passages or parts for the admission or ejection of steam or other fluid to or from a cylinder or other vessel.

Rotten Row. A row of old vessels in ordinary.

Rotterdam, in South Holland, in the Netherlands, is situated at the confluence of the Rotte with the Maas, in lat. 51° 55′ 3″ N., lon. 4° 29′ 5″ E. This city is more favorably situated for trade than Amsterdam; its canals admit the largest vessels. Its commerce has increased rapidly, and it now exports to the West Indies provisions, wines, and manufactured goods; to England and Scotland cheese, butter, flax, fruits, sheep, and cattle, and it has also a considerable trade with America, France, Spain, Portugal, and the northern countries of Europe. Besides its extensive commerce it has many distilleries, breweries, dye-works, refineries, and ship-building yards. Pop. 125,000.

Rouen, the capital of the department of Seine-Inférieure, France, is located on the right bank of the Seine, in lat. 49° 26′ N., lon. 1° 6′ E. The staple manufactures are cottons in a great variety of forms. It is also famous for its confectionery. There are also tanneries, sugar-refineries, copper- and iron-foundries, forges and rolling-mills. Situated as it is on a navigable river, accessible by large vessels, it has a considerable trade in grain, flour, wine, brandy, salt, oil, wool, and the various articles of its manufacture. Pop. 105,000.

Rough-knots, or Rough Nauts. Unsophisticated seamen.

Rough Log. The book in which the journal of the ship is originally written. A smooth copy,

signed by the watch-officers, is inspected by the commanding officer, and forwarded to the Navy Department. See Log-book.

Rough-spars. Cut timber before being worked into masts, etc.

Round. The rung or step of a Jacob's ladder. *A round of ammunition*, a charge for each fire-arm or piece of ordnance. *To round a point*, to sail round it; to double it. *To round to*, to haul by the wind when sailing large. *To round in*, to haul in on a weather brace. *To round up*, to haul in on a fall so as to bring the two blocks together, the movable block being disconnected from the weight. *To round down*, to overhaul a tackle to permit the lower block to descend.

Round and Grape. A term used when a gun is charged with a solid shot and grape-shot or canister. It was used in former times at close quarters.

Round Dozen. A term for thirteen lashes.

Roundhouse. A name given, in large merchantmen, to a square cabin built on the after part of the quarter-deck. In men-of-war the roundhouse is the place set apart for the convenience of the officers.

Rounding. Strands wrapped around a rope to prevent chafe.

Roundly. Quickly.

Round-ribbed. A vessel of burden with very little run and a flattish bottom, the ribs sometimes almost joining the keel horizontally.

Round Robin. A paper signed with the names arranged in a circle, so that it is impossible to tell who signed it first. The object is to prevent the singling out and punishing of the first signer.

Round Seam. A seam in which the edges are sewed together without lapping.

Round Seizing. See Seizing.

Round Shot. Spherical solid shot.

Round Splice. A long splice skillfully made.

Round the Fleet. A diabolical punishment, by which a man, lashed to a frame in a boat, was towed alongside of every ship in a fleet, to receive a certain number of lashes by sentence of court-martial.

Round-top. A name which has obtained for modern tops, from the shape of the ancient ones. See Top.

Round Turn. A turn with a rope entirely around a spar or belaying-pin. *To bring up with a round turn*, to stop suddenly and effectually. See Hawse.

Rouse. To haul with great force. *Rouse and bitt!* turn out! get out of bed!

Routine of Duty in a Man-of-war. In carrying on the duties of a man-of-war a systematic routine is adopted. This varies whether at peace or in war, in port or at sea, in warm or in cold climates; whether the ship is a cruiser, a surveying-ship, a receiving-ship, a training-ship, a practice-ship, a flag-ship, or a gunnery-ship, an armored or an unarmored vessel; but the same general ideas govern the routine in all these cases. The principal written routines are for harbor- or sea-duty, and being prepared by the executive-officer and sanctioned by the captain, are promulgated to the crew, and carried out by the watch- and junior officers. Routines are also prepared for the engine-room, and the duty in the paymaster's and surgeon's department is carried on in a systematic way, although no written routines exist. Routines are arranged with reference to the quarter, month, week, day, or watch. The quarterly routine prescribes the arranging and forwarding the reports required from all officers in command or in charge of departments, and an inspection by the commander-in-chief and staff of all vessels in the fleet. Chains and anchors are carefully overhauled once a quarter, and target practice with great guns and with small-arms, at the most convenient times, is usual. The monthly routine prescribes the reports required, and on the first Sunday the crew are mustered and the "Articles of War" are read to them; on the first Monday hammocks are scrubbed, on the second, bedding, on the third, hammocks, and on the fourth, bedding. Once a month hammocks are triced up in the rigging, opened out, and bedding thoroughly aired. Every alternate Saturday it is usual to scrub wind-sails, and every alternate Wednesday, hose-reels, boat-covers, gangway-screens, etc. On the last day of the month officers of divisions inspect the clothing and outfit of each man and make requisitions for deficiencies therein, and soon after the first of the month the paymaster issues to the crew the articles required. Money in small amounts is paid to the men each month, and mess-stores issued twice in a month. The weekly routine is subject to greater variations. On Sundays only necessary cleaning is done. After quarters and inspection of the crew, divine service is read. On Mondays, Tuesdays, Wednesdays, Thursdays, and Fridays clothes are scrubbed at sea, and on Mondays, Wednesdays, and Fridays in port. Decks are scrubbed on these days; with sand on Wednesdays, only. On Saturdays, decks are thoroughly "holystoned" with sand, guns run in, all woodwork scrubbed, and the ship thoroughly cleaned inside and out. Sometimes particular parts of the uniform are scrubbed on each day, but this is not usual. With the weekly routine is connected the drill routine, prescribing the mode of carrying on the drills. On Mondays, general quarters as for action and drills thereon, and on Fridays, a fire-alarm and drills connected with it, are usual. On Tuesdays, Wednesdays, and Thursdays the various divisions of men alternate in exercises at the guns, at small-arms, with singlesticks, pistols, howitzers, or Gatlings. Once a week battalion drill is usual, and the squadron of boats also goes out.

The daily routine is carried out by watches. The men are roused by "reveille" in port, the "idlers" at sea at early daylight, and the watch at sea at 7 A.M. The "morning" watch is consumed by the scrubbing of clothes and decks, and at sea, getting sails in order, etc. Sometimes an early breakfast is given, sometimes at 8 in port, allowing three-quarters of an hour. At sea, one watch goes to breakfast at 7.30, and the other at 8. At 8 "colors" are hoisted, and in port sails are loosed to dry or light yards sent up. The forenoon watch lasts until 12. Breakfast over at 8.30, bright metal-work is cleaned, and at 9 "sick call" is beaten for the invalids to assemble in the hospital. At 9.30 the drum beats to "quarters" for inspection, and drills follow. After they are over, the mechanics and laboring-parties go to work. At sea, the navigator is sent for at 11.30, and the sun announces

to him noon and the latitude. In port, sails when loosed are often furled at 11.30, or wash-clothes sent below. Dinner comes in all cases at 12, and one hour is allowed to all in port, half an hour to each watch at sea. Sometimes, in the afternoon, a drill with sails, boats, or muskets follows, and work is resumed. At 4, 4.30, or 5, half an hour is given to supper. Afterwards evening quarters for muster comes, and at dusk hammocks are given out. Fires are put out at 8, and "tattoo" beaten at 9. There is no routine for the night watches.—*F. S. Bassett, Lieutenant U.S.N.*

Rove. A small copper ring or washer over which the end of a nail is clinched.

Rovens. A corruption of *rope-bands*. Also, the ravelings of canvas or bunting.

Rover. A pirate or freebooter. (See PIRATE.) Also, a kind of piratical galley of the Barbary States.

Roving Commission. An authority granted to an officer in command of a vessel to cruise wherever he may see fit.

Row. To propel a vessel by oars or sweeps. *To row dry*, to so manage the oars as not to splash water into the stern-sheets of the boat. *A dry row* is a punishment administered for some offense connected with boats or rowing. The offender is sent into a boat at the davits and required to go through the motions of rowing, much to his own discomfiture and to the amusement of the ship's company. *To row in the same boat*, to hold similar opinions; to indulge in similar practices.

Several styles of rowing are to be met with in different parts of the world. We give a long full stroke with a quick return, depressing the loom just sufficient to clear the water on the return; the English generally feather high, throwing the blade above the horizontal; but the most peculiar style is that known as the *Dago stroke*, in which the oarsmen take a long stroke, and then wait for the headway to cease before giving another; it is supposed, by the people who are addicted to it, to border on the majestic. The *breast-stroke* is affected in single-banked boats; the oarsmen push the loom of the oar well forward beyond their bodies,—the worst possible application of force. *Feathering* is inclining the upper edge of the blade forward, after the stroke is finished, in order that it may be released readily from the water, and also to present a small resistance to the air on the return. If the oar is not feathered the blade is apt to be swept aft and the loom jammed in the rowlock, before it can be raised clear of the water; this is termed *catching a crab*.

ROWLOCK. An aperture cut in, or a swivel crutch fitted on, the gunwale of a boat, to act as a fulcrum for an oar in rowing.

ROW-PORTS. Certain scuttles or square holes, formerly cut through the sides of the smaller vessels of war, near the surface of the water, for the purpose of rowing them along in a calm or light wind, by heavy sweeps, each worked by several men.

Rowan, S. C., Vice-Admiral U.S.N. Through the influence of the Hon. William McLean, of Ohio, the brother of that distinguished statesman and jurist, the Hon. John McLean, an appointment as midshipman in the navy was secured for young Rowan. Before entering upon this career—a career entirely congenial to his nature and tastes—he passed some time at Oxford College, Ohio, devoting his time and attention to such studies as would be most useful in preparing himself for the profession he was about to embark in. Shortly after receiving his appointment, in 1826, he was ordered to the sloop-of-war "Vincennes," attached to the Pacific Squadron, on board of which ship, and on that station, he served a full cruise. In 1831 he was attached to the schooner "Enterprise."

Promoted to a passed midshipman, April 28, 1832, he was ordered to the sloop-of-war "Vandalia," and remained two years on board that vessel in the West Indies. In 1837 he was ordered to the store-ship "Relief," and in the same year commissioned as a lieutenant. In 1840 he was engaged on coast survey duty, and in 1843 was serving on board the line-of-battle ship "Delaware," on the Brazilian Station. In 1846–48 he was the executive-officer of the sloop-of-war "Cyane," attached to the Pacific Squadron, and took an active part in the war then waging with Mexico.* As the executive of that vessel he succeeded in impressing upon the *personnel* of the ship his own individuality, and no vessel in that squadron was more conspicuous for discipline, drill, efficiency, and service. Always in readiness, she was actively and constantly engaged, and her opportune arrival at San José, Cal., saved that stubborn fighter and brave gentleman, the noble Heywood, and his gallant party from annihilation or capture. While attached to this vessel Lieut. Rowan commanded the naval battalion under Commodore Stockton in its various operations against the enemy, and at the battle of Mesa was conspicuous for cool judgment, courage, and distinguished service. The results of this battle were the occupation of Los Angeles, the capital of the country, and the surrender of California by the Mexican governor, Don Andreas Pico, to the authorities of the United States. After the occupation of Mazatlan by the naval forces, Lieut. Rowan commanded a landing-party that marched some distance into the country and made a successful night attack upon the enemy, driving them with loss from their position; he was also engaged while attached to the "Cyane" in the bombardment of Guaymas. During the years 1850–53 and 1858–61, Lieut. Rowan devoted himself to ordnance duty in acquiring a thorough knowledge of that important branch of the service, and thus preparing himself in this respect for the high command and heavy responsibilities which were so soon to devolve upon him.

In September, 1855, he was promoted to a commander, and ordered to the command of the store-ship "Relief." The breaking out of the Rebellion found him in command of the steam sloop-of-war "Pawnee." Almost without warning this terrible civil war, with all its attendant

* Upon the arrival of Commodore Sloat in Monterey, Cal., the policy of the government in the recently inaugurated war with Mexico had not been announced to that officer, and he was left to his own judgment to determine the question. Fortunately he was surrounded by officers of the stamp of Rowan and the present Medical Director Charles D. Maxwell, than whom no officers were more zealous in advocating the immediate occupation of California, and the hoisting of our flag upon its soil. To the navy alone the Republic is indebted for the acquisition of this splendid territory with all its untold wealth.

consequences, shook the land from its centre to its remotest boundaries. Commander Rowan had married, in Norfolk, Va., the daughter of Dr. Starke, an eminent citizen of that city, and there resided; it was the home of his adoption and of his affections; there were the friends of many years, the attachments of a life. Those who know the high-strung character of this people know with what an earnest purpose they entered into the strife, and how quick they sprang to action. No time was given and none required by Rowan to determine what course he would take. Abandoning home and friends and all that made life attractive, his course was at once determined, and in the cause of the Union and in defense of the flag he drew his sword with an unfaltering spirit and determined heart. Would that the high and lofty motives actuating this gentleman had entered into the souls of those who went astray after false doctrines and heresies, and so preserved them also to the navy and the service of the country to receive its highest honors! The government, knowing the lofty character and reputation of Rowan, had no misgivings as to his loyalty, and he was continued in command of the "Pawnee." In this vessel he engaged, shortly after the breaking out of hostilities, the enemy's batteries at Acquia Creek, on the Potomac. This was the first naval engagement of the war. Later, in the "Pawnee," he participated in the attack on and in the capture of the forts and garrison at Hatteras Inlet, the first important naval success of the war, in the honors of which Commander Rowan fully shared. The joint expedition of the army and navy for operations in the waters of North Carolina, to which Rowan had been ordered as second in command, and which sailed from Hampton Roads in January, 1862, was about to open a suitable field for the display and employment of the high qualities and professional attainments he possessed. The naval force, which consisted of 17 light-draft vessels, arrived at Hatteras Inlet January 13, 1862, but the army was not fully prepared for active co-operation until three weeks later. On the morning of February 5 the combined expedition proceeded toward Roanoke Island. The naval vessels, placed by Admiral Goldsborough under the immediate command of Commander Rowan, were formed in three separate columns, commanded respectively by Lieuts. Reed Werden, Alexander Murray, and H. K. Davenport. The enemy had formed an extensive obstruction of a double row of piles and sunken vessels, stretching across the sound between the batteries on Park and Wier Points, and behind this their vessels, 8 in number, were drawn up. By half-past ten on the morning of February 7 the engagement commenced. By noon the action became general, and was continued so hotly that at two o'clock the battered barracks behind the fort were burning furiously, and at half-past four the batteries, for the most part, ceased for a while to reply to the firing of the fleet,—5 of the enemy's steamers, apparently injured, retired behind the point, and the first landing of troops took place. The landing was effected in light-draft steamers and boats at Ashby's harbor, a large body of the enemy guarding the shore being soon cleared away by some shrapnel from the guns of Rowan's flag-ship. By midnight 10,000 troops had been landed, when they were joined by a battery of six howitzers from the naval force. At nine o'clock the next morning a continuous firing in the interior announced that the army was hotly engaged about midway between the landing and Park Point, and the vessels moved up to re-engage the forts. When Burnside approached the rear of the batteries the vessels ceased firing, and proceeded to clear a passage-way through the obstructions. By 4 P.M. this was accomplished, and when the vessels burst through the obstructions the American flag was unfurled over the battery on Park Point. A few minutes afterward the enemy fired the works on Red Stone Point, together with a steamer which had taken refuge under its guns, and thus ended the eventful struggle of two days, which secured complete possession of Roanoke Island. Retreating from Roanoke Island, the enemy's fleet fled up the sound and into Pasquotank River toward Elizabeth City, Commander Rowan pursuing them with a flotilla of 14 vessels, and anchoring for the night a few miles from Fort Cobb. On the morning of the 10th they were discovered drawn up behind the battery, which mounted four heavy guns, and supported by a schooner—the "Black Warrior"—moored to the opposite bank, and carrying two heavy 32-pounders. When within long range fire was opened from the battery, schooner, and steamers, but the vessels moved on silently and steadily, shot and shell falling thick and fast among them. When within three-quarters of a mile of the battery Commander Rowan gave the signal for a dash at the enemy; fire was opened with telling effect, and the vessels pushed to their utmost speed. The enemy was completely demoralized by the bold and wholly unexpected mode of attack. The "Black Warrior" was set on fire by her officers and destroyed, the fort abandoned, and the entire fleet captured or destroyed. Passing up the river, the flotilla took possession of Elizabeth City, which the enemy had attempted to fire before hastily leaving, and Lieut. Murray was dispatched with a small force to Edenton, which he quietly took possession of on the 12th, and was then sent to obstruct the Chesapeake and Albemarle Canal, a duty which he thoroughly accomplished. At the same time Commander Rowan made a reconnoissance of the Chowan River as far as Winton, where a sharp engagement took place on the 19th; the town was the following morning occupied by the troops under Col. Hawkins, who entered the place and destroyed the military stores and quarters found there. A combined expedition of the army and navy, under Gen. Burnside and Commander Rowan, left Hatteras Inlet on the morning of March 12 for an attack upon Newbern, N. C. The fleet, numbering 14 vessels, besides the transports, entered the Neuse River in the afternoon, and at nightfall anchored in three columns off Slocum's Creek, the point selected for the debarkation of the troops, about 15 miles from Newbern. Early the following morning the gunboats were deployed on either side of the mouth of the creek, and opened with grape and canister upon the landing-place, while the troops started from the transports,—the fire ceasing as soon as the first brigade had landed. At the same time six naval howitzers, under command of Lieut. R. S. McCook, were sent ashore to assist in the attack upon the enemy's works. As soon as

the troops had landed, the flag-ship "Delaware," Lieut.-Commander S. P. Quackenbush, with another vessel, proceeded on a reconnoissance up the river, when fire was opened from Fort Dixie upon them, and a spirited engagement was kept up until dark, when all the vessels anchored for the night in a position to support the troops. At daylight on the morning of the 14th, Gen. Burnside engaged the enemy in force, and Commander Rowan advanced steadily up the river with his fleet. The passage of the river was obstructed by a formidable line of piles and torpedoes, and defended by six well-constructed forts, at distances of half a mile to a mile and a half from each other, mounting some 32 heavy guns; but under pressure of the combined attacks the enemy abandoned their defenses in succession,—the navy and army contesting the honor of raising the American flag on their ramparts,—so that at noon the fleet arrived before the deserted town of Newbern. A large quantity of public stores fell into the hands of the navy and were turned over to the troops, who arrived and took possession of the town at 2 P.M. After the fall of Newbern, Lieut. Commanding Murray was dispatched with a naval column to take possession of Washington, N. C. On April 1, Commander Rowan dispatched to New York and Philadelphia 9 vessels freighted with naval stores, some of the fruits of the capture of Newbern. Fort Macon was the next object which engaged the attention of the army and navy. On the morning of April 25, Commander Samuel Lockwood, the senior officer off Beaufort, opened on the fort in conjunction with the batteries on shore, and continued the fire for some time, until he was obliged to withdraw on account of the heavy sea. Toward evening a flag of truce appeared on the fort, and the next morning the old flag reappeared over its ramparts. Entering the fort, Commander Rowan had an interview with Gen. Burnside, with whom he signed the terms of capitulation on the part of the United States. Commander Rowan, at the same time, finding that the army had failed to accomplish the object for which it was landed at Elizabeth City, and had returned without destroying the canals, determined to undertake the work with the navy. Lieut. Hurser, with 3 gunboats and 2 schooners, with the needed means and appliances, was dispatched upon this duty, and fully accomplished the object, inflicting in two days an amount of damage that it would require months to repair.

In reviewing this brilliant series of successes and victories, of paramount value to the Union cause, we cannot fail to recognize the fine skill, untiring energy, cool and tempered judgment, quick perception and dash of Rowan, which fully establish his claims to rank with the leading naval commanders of the day. No grass grew under his keel; no victory was gained until all its fruits were fully garnered. Like the waves of the sea, success followed success, and while there was work to be done he rested not, nor allowed others to rest. This was war never better illustrated. Unlike some intrusted with high commands, who failed to follow up the result of a victory, he pursued with untiring energy and determined will the demoralized foe. Quick to perceive and prompt to act, his command of the naval forces in the sounds of North Carolina resulted in the complete restoration of the authority of the government over those waters.

Commander Rowan was promoted to a captain July 16, 1862, and as a reward for these brilliant services and for his distinguished gallantry was advanced a grade and promoted to a commodore, to take rank from the same date. In 1863, Commodore Rowan was ordered to the command of the armored frigate "New Ironsides," then in Charleston harbor operating against the enemy, and probably at the time, handled and fought intelligently, the most formidable vessel afloat. While upon this duty it was the good fortune of the writer of this article, in command of a monitor, to be a daily witnes to the fine handling of this formidable vessel and the splendid work she accomplished; to be thrown into daily intercourse with her distinguished commander; to see him upon this arduous service, in fire and out of fire, always the same wise, cool, capable, self-reliant, considerate leader and officer. While the ship in the hands of the uninitiated would have proven powerless and obstinate, under his guidance she was always reliable, acting as though she possessed a soul responsive to his own, and dutifully and obediently following his will. Nothing finer nor grander than to see this noble ship as she moves to challenge and engage the formidable forts and batteries lining the harbor at Charleston. Presently, as she comes within range, forts and batteries upon all sides open upon her a furious shower of shot and shell, and no response. Grand, gloomy, and defiant, heeding nothing but the will of her master, she moves on through the storm of battle until approaching the desired position; then Rowan turns to his famous executive, "Try the range, Belknap," and the flash and report of a single gun follow. Still, like an avenging angel, the ship moves on till another shot follows, and then a broadside of 11-inch guns with blast of fire and sound of many thunders breaks the silence of the ship, and she is alive with flame and fury,—great guns topple over, the crests of the enemy's works go down like grass before the scythe of the mower, and silence again ensues, to be followed by successive broadsides, until the enemy no longer replies. So day after day and month after month, while the monitors, with their deliberate fire of the heaviest guns, attack the defenses of the enemy, and hour after hour the battle rages unabated, when the mighty man-of-war moves majestically into position and opens upon them, the enemy soon flee to their bomb-proofs for shelter, and their guns are silent. And yet so paradoxical are the conditions of naval warfare, a single shot from one of the heavy guns of the tiny monitors and the proud career of this formidable vessel would have been speedily brought to a close. In this severe, exacting, and arduous service Commodore Rowan passed many months in command of the "New Ironsides," engaged in almost daily conflict with the enemy, and upon each and every occasion increased his bravely-earned reputation. No one can appreciate but those who have shared in the dangers, trials, and privations the character of this service, with its days of toil and exposure, and its nights of unrest and battle, where exhausted nature only found repose mid the din and sound of the conflict. In the spring of 1864, the services of the "New Ironsides" being no

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longer required before Charleston, the ship was ordered North, and Commodore Rowan was shortly after relieved of the command.

In July, 1866, he was, by selection, promoted to a rear-admiral, and ordered to the command of the Norfolk Navy-Yard, where he remained two years. During the years 1868–69 he commanded with ability the Asiatic Squadron. While absent upon this duty from the United States he was, upon the death of Farragut and the promotion of Porter, selected by Gen. Grant as the vice-admiral of the navy, in recognition of the conspicuous and valuable service he had rendered to the republic. It was the pleasant duty of the writer to be the first to announce to Vice-Admiral Rowan his promotion, on his return to the United States, and the first to salute the flag of the newly-promoted vice-admiral. Several years subsequently, Vice-Admiral Rowan was in command of the naval station at New York, and at present is employed as president of the Board of Examiners. Admiral Rowan has but one descendant, Lieut. Hamilton Rowan, of the U. S. army, now stationed at Fort McHenry, near Baltimore, a young officer of excellent promise and reputation.—*T. H. Stevens, Rear-Admiral U.S.N.*

Rowle. A light crane, formerly much used in clearing boats and holds.

Royal. The sail next above the topgallant-sail. It is the uppermost sail ordinarily carried; those sails sometimes set above the royals are known as sky-sails, moon-sails, moon-rakers, star-gazers, etc., and are comprehended under the general term *kites*. Royals are carried only in light breezes, not only because the sails are small and their masts badly supported, but because they act with a long leverage and tend to bury the ship and retard her progress. For the gear of a royal, see under proper heads.

ROYAL-MAST. See MASTS.

Royal Fish (*Eng.*). Whales, porpoises, sturgeons, etc., which, when driven on shore, become droits of admiralty.

Royal Marines (*Eng.*). See MARINE CORPS, FOREIGN.

Royal Merchant. A title of the Mediterranean traders of the 13th century, when the Venetians were masters of the sea.

Royal Mortar. An old brass mortar of 5½ inches diameter of bore, and 150 pounds weight, throwing a 24-pounder shell up to 600 yards,—convenient for advanced trenches and boat-work.

Royals (*Eng.*). A familiar appellation for the marines since the mutiny of 1797, when they were so distinguished for the loyalty and steadiness they displayed. Also called *royal jollys.*

Roynes. An archaic term for streams, currents, or other usual passages of rivers and running waters.

Rubber. A small instrument used to rub or flatten down the seams of a sail, in sail-making.

Rubble-work. A mass of masonry, formed of irregular stones and pebbles imbedded in mortar. It is used in the interior of docks, piers, and other erections, and is opposed to *ashlar-work.*

Rudd. A fresh-water European fish of the carp family; *Leuciscus erythrophthalmus;* red-eye. It is about the size and shape of the roach, with which it is often confounded, but it has the dorsal fin farther back, a stouter body, and red irides.

Rudder. That part of the helm of a vessel which is attached to the stern-post, and by whose movements the vessel is steered.

The rudder, being turned out of the line of the keel, is acted upon by the water as the vessel passes through it, and causes the vessel to turn about her centre of gravity, the bow moving in the direction in which the rudder is turned, while the stern moves in the opposite direction.

The greater the angle which the rudder makes with the plane of the keel, the more it acts as a drag and impedes the speed of the vessel. For this reason it should be turned only so much as is necessary to steer the vessel, and in this the skill of the helmsman is shown. The arc in which the rudder can turn is seldom more than 45° on each side of the plane of the keel, and even this amount is not required to turn a vessel in the shortest time. The force that the water exerts upon the rudder varies as the square of the vessel's speed, and it is by this force that the vessel is turned. The proper amount of helm angle varies in vessels of different models, and can best be ascertained by actual experiment.

Rudders are constructed of wood or iron according to the material of which the vessel is built. A wooden rudder is composed of several pieces of timber coaked and bolted together. The upper part, called the rudder-head, is of cylindrical shape, and passes through the rudder-port in the counter to a height above the deck sufficient to connect the tiller or gear by which the rudder is turned. The piece of timber of which the head is composed extends the length of the rudder and is called the main-piece. On the forward and after sides of the main-piece additional timbers are secured, forming, from the lower part of the head (called the shoulder) to the lowest part of the rudder (called the heel), a flat structure, the after edge of which is usually of a convex shape, while the forward edge is straight and in line with the stern-post of the vessel. The rudder is hung to the stern-post by the pintles, which are fixed to the forward edge and set into the gudgeons or braces on the stern-post These constitute the hinges by which the rudder is supported and upon which it turns.

The forward edge of the rudder and the after edge of the stern-post are beveled to allow the required helm angle, and upon the lower part or heel a piece is fastened, called the sole-piece, which, like the false keel, may become easily detached if the vessel takes the ground. To prevent the rudder from unshipping, a wooden block, called a wood-lock, is placed in the aperture under the upper pintle. All of the pintles and braces and the centre of the rudder-head are in the axis of motion of the rudder. The rudder is turned on the deck of the vessel by means of a horizontal bar, called the tiller, placed in a socket in the rudder-head. Greater power is obtained in large vessels by using a wheel which is connected with the tiller by means of ropes, called wheel-ropes, or by other mechanical contrivances. Wooden rudders are sheathed with copper or yellow metal to the same height that it is placed upon the bottom and sides of the vessel to which they belong.

An iron or steel rudder is of the same general shape as the wooden rudder. It consists of a frame covered on both sides with metallic

plates, which are riveted through the frame-work to each other, and is hung to the stern-post or rudder-post by pintles and gudgeons as already described

In order to give greater breadth to the rudders of screw-steamers of great length and comparatively small depth, without an increase of strain upon the rudder-head, the equipoise rudder has been devised. It is convex on both forward and after edges, and, instead of being supported by pintles and braces, it rests upon a projection from the keel called the skeg. The axis of motion passes through the centre of the rudder-head and the centre of the socket of the skeg in which the heel rests. About two-thirds of the surface of the rudder is abaft the axis of motion, and one-third forward.

The breadth of a rudder depends, in some measure, upon the comparative dimensions of the vessel, her model, etc. A short, full vessel requires a rudder of greater breadth than a long, sharp one; while a vessel of comparatively light draft of water requires a broad rudder. The proportions in which they are usually made are 1 foot in breadth to every 100 feet in length of the vessel and 1 foot additional.

A jury-rudder is made to replace one that has been injured and rendered unserviceable. It is made from such material at hand as may be best suited to the purpose,—as spare spars, plank, etc.

A vessel may be temporarily steered by a hawser veered out over the stern, and moved toward one quarter or the other, as required, by means of tackles.—*E. T. Strong*, *Lieutenant U.S.N.*

Rudder-band. An iron band placed around the head of a wooden rudder.

Rudder-braces. The composition hinges on which a rudder turns.

Rudder-case. The casing placed around the head of a rudder. It is also termed the *well.*

Rudder-chain. One of the chains by which the rudder is secured to the quarters of the ship in the event of its being unshipped by accident.

Rudder-chock. See Chock.

Rudder-coat. An outside covering made of canvas, formerly used to prevent the water coming into the rudder casing and thence into the ship; there are better plans in use nowadays.

Rudder-horn. A kind of iron crutch bolted to the back of the rudder, for attaching the rudder-chains to in case of necessity.

Rudder-irons. The pintles, gudgeons, and braces of the rudder are frequently so called, though they are usually of copper.

Rudder-pendant. A continuation of the rudder-chains in wire rope; it usually leads up to each quarter, so as to be easily reached from the quarter-deck.

Rudder-perch. A small fish with the upper part of the body brown, varied with large round spots of yellow, the belly and sides streaked with lines of white and yellow. This fish is said to follow the rudders of ships in the warm parts of the Atlantic.

Rudder-port. The round port made in the stern of the ship in which the rudder ships.

Rudder-stock. The main piece of a rudder.

Ruffle. A low vibrating sound of the drum, continuous like the roll, but not so loud; it is used in complimenting officers of rank.

Rule-staff. A lath about 4 inches in breadth, used for laying off curves in ship-building.

Rumbelow. A very favorite burden to an old sea-song, of which vestiges still remain.

Rumbo. Rope stolen from a dock-yard.

Rumbowline. Condemned rope. Inferior rope used for securing new coils.

Run. To desert. To scud. The distance sailed by a ship. The after part of the body of a ship,—it is *clean* or *full* as it is sharp or otherwise. *To let go by the run*, to let go altogether. *To run down a coast*, to sail parallel with and near to the coast. *To run down a vessel*, to run into her bows-on. *To run down a port*, to sail into the latitude of a port and then run for it on its parallel,—a method practiced in the early days of navigation, before chronometers came into general use.

Run, Correction for. In "double altitudes," the correction for the distance passed over in the interval between the taking of the observations, to reduce one altitude to what it would have been if taken at the place of the second observation.

Run-money. The money paid as a reward for apprehending a deserter or straggler. It is checked against the accounts of the person apprehended.

Running-down Clause. A special admission into policies of marine insurance, to include the risk of loss or damage in consequence of the collision of the ship insured with other vessels.

Rundle. That part of a capstan round which the messenger is wound, including the drum-head. See Whelps.

Rune. A water-course.

Rung. The round of a Jacob's ladder.

Rung-head. A name sometimes given by shipwrights to the upper end of a floor-timber; it is more properly called a *floor-head.*

Runner. A single rope rove through a movable block, having an eye or thimble in the end, to which a tackle is hooked. A ship which risks every impediment as to privateers or blockade, to get a profitable market. *Runners of foreign goods*, organized smugglers.

Running Agreement (*Eng.*). In the case of foreign-going ships making voyages averaging less than 6 months in duration, running agreements can legally be made with the crew to extend over two or more voyages.

Running-block. The movable block of a purchase.

Running-bowline. A bowline made over the standing part of the same rope.

Running-bowsprit, or Running-in Bowsprit. A bowsprit in small craft which is rigged in when the sail is taken in. It is sometimes so fitted as to be rigged in partially when the sail is reefed.

Rupee. An East Indian coin. See Money.

Russian Navy. To Peter the Great, who reigned between 1672 and 1725, belongs the honor of creating a regular navy in Russia. The country was still in a state of semi-barbarism, and Peter saw that to enable it to cope with other European nations an effective maritime force was an essential element of strength and an instrument of civilization. As there was no one in his territories of the requisite intelligence and practical knowledge of seamanship to enable him to carry out his projects, Peter overcame a

constitutional apathy to the sea and made several voyages in trading-vessels that he might acquire an insight into navigation. Acting upon the wholesome doctrine of never leaving to others that which can be accomplished by oneself, Peter remained for some time at Archangel watching the progress of ship-building. But the crude nature of the operations not satisfying him, he went to Holland, where he labored as a common artisan in the dock-yards, and compelled his suite to follow his example. "Ships, colonies, and commerce" were the great objects of his stupendous labors. By the year 1721 something like a Russian navy was established, and Peter had the satisfaction, before his death, of achieving a victory over the Swedes in his Finland operations. Some advantages were likewise gained over the Turks in the Black Sea toward the close of the eighteenth century. Not, however, until A.D. 1803 were Russian ships of war much employed, and in that year their mission was peaceful. Two vessels were equipped for a voyage round the world.

The ambitious schemes and political complications of Napoleon Bonaparte compelled Russia to give her attention to her army, and full employment was found for it on land. Some years, therefore, elapsed before the efficiency of the navy could be tested, and in that time all the operations of the department were limited to wars with the Turks. But when the Emperor Nicholas came to the throne, in succession to Alexander, a lively movement was made toward the improvement of the maritime power of Russia. The Emperor Nicholas saw, what had long been manifest to the rest of the world, that, though the Baltic and the Black Sea afforded fine scope for nautical experiments and the construction of ships of war, those seas had each but one narrow outlet to the North Sea and the Mediterranean, and that, therefore, when engaged in hostilities with any other power, they might easily be blockaded, neutralizing the best efforts of the navy. Nothing but superior force could clear the passages for Russian commerce, or for a fair fight on the enemy's ground. Accordingly, Nicholas invited men of science and skilled artisans to accept employment at the dock-yards, which were established at Cronstadt, Nicolaief, and Sebastopol. He further founded colleges for the education of naval cadets and schools for the instruction of workingmen, and raised a battalion of pilots capable of navigating the seas of the whole world. So rapid, under the emperor's auspices, was the progress of improvement and natural strength, that, by the year 1838, the Baltic force of Russia comprehended 4 three-deckers, carrying 110 guns each, 7 carrying 84 guns, 19 armed with 74 guns, making 30 heavy line-of-battle ships, and 21 frigates of different sizes, the whole fleet being manned by 30,000 good sailors. In the Black Sea and in the Caspian there were 16 heavy ships of war, besides a large number of frigates and sloops. In this condition the Russian navy continued until 1854, when the junction of England, France, and Sardinia, in espousal of the cause of Turkey, then at war with Russia, led to hostilities in the Baltic and the Black Sea, causing serious damage to the marine force of Russia. Since the termination of the war of 1856 Russia has busily recuperated her naval force, and at the beginning of 1879 it consisted of 30 armored ships and 199 other vessels, including all classes and descriptions, carrying altogether 561 guns, and having engines aggregating 188,120 horse-power. The fleet, although numerous, is not powerful. The "Peter the Great" and "Knuz Minin" are the only two vessels on the list of sea-going armored ships which are up to the modern standard. For coast defense Russia has a considerable fleet, of which the two circular vessels, the "Novgorod" and "Vice-Admiral Popoff," are the most formidable. The next in power are 10 monitors of early date, on Ericsson's plans, similar to our harbor and river monitors, drawing nearly 12 feet of water, and armored on the sides with 5-inch plates on a backing of nearly 3 feet. The two guns in the single turret are 9-inch rifles or 15-inch smoothbores of old pattern. There are, however, two other monitors of later date and somewhat greater power, built in Russia in 1868. These are the "Tcharogeika" and "Rousalka." The side-armor is 5 inches thick, and on the turrets 6 inches. They carry four 11-inch rifles in two turrets. The speed of all these monitors is given at from 6 to 8½ knots. The chief characteristic of the two circular ironclads is that they are purely and simply sea-citadels propelled by steam, and without any attempt to make them conform to the shape of an ordinary ship. The regular cruising fleet may be divided into two branches, the American-built cruisers and the Russian-built cruisers. Two of the American vessels, the "Europe" and "Asia," were built by Messrs. Wm. Cramp & Sons, who also constructed from designs prepared by the Russian Admiralty a fourth vessel, the "Zabiaca." The "Africa" was built by Messrs. John Roach & Son, but all of them were converted into war-vessels at the yard of the Messrs. Cramp, of Philadelphia. The principal advantages possessed by these cruisers are light draft of water, high speed, and considerable sail area. The Russian-built cruisers have all been built at St. Petersburg since 1875, and were all designed by Capt. Subbotin, the Russian naval architect. The navy is represented in the Council of State by the admiral-general, a prince of the blood, who is commander-in-chief of the naval force. The head of the central administration is a minister chosen from the list of vice-admirals. There are six sections or departments of control: 1st. The Chancellery, having charge of the expenditure of the budget. 2d. The Department of the Personnel. 3d. The Hydrographic Department. 4th. The Technical Committee, divided into three sections,—construction of vessels, construction of machinery, and construction of ordnance. 5th. The Supreme Naval Tribunal. 6th. The Direction of the Health Service. The *personnel* is classified as follows:

Executive-Officers: General admiral, 1; admirals, 15; vice-admirals, 36; rear-admirals, 32; captains, first class, 223; captains, second class, 89; lieutenant-captains, 317; lieutenants, 324; midshipmen, 195. Total, 1232.

Officers of Naval Artillery: Lieutenant-generals, 2; major-generals, 2; colonels, 13; lieutenant-colonels, 9; captains, 21; staff-captains, 38; lieutenants, 20; sub-lieutenants, 42; ensigns, 47; cadets, 12. Total, 206.

Engineers of Naval Constructions and Ma-

chinery: General, 1; lieutenant-generals, 3; major-generals, 4; colonels, 7; lieutenant-colonels, 4; captains, 17; staff-captains, 22; lieutenants, 81; sub-lieutenants, 33; ensigns, 17; cadets, 6. Total, 145.

Engineer Mechanicians: Major-generals, 2; colonels, 8; lieutenant-colonels, 11; captains, 49; staff-captains, 62; lieutenants, 99; sub-lieutenants, 164; ensigns, 140; cadets, 13. Total, 548.

Hydrographic Engineers: Lieutenant-generals, 2; major-generals, 18; colonels, 18; lieutenant-colonels, 32; majors, 9; captains, 43; staff-captains, 53; lieutenants, 61; sub-lieutenants, 61; ensigns, 24. Total, 321.

Medical corps of all classes, 209.

Marine Officers: Lieutenant-generals, 3; major-generals, 3; colonels, 11; lieutenant-colonels, 36; captains, 74; staff-captains, 119; lieutenants, 94; sub-lieutenants, 96; ensigns, 60; cadets, 25. Total, 521.

Total officers, 3182; seamen and marines, 38,986. Grand total, 42,168

The cost of maintaining the Russian navy, according to the official estimates of the Minister of Marine for 1879, was $19,421,276.70. There are two dock-yards for the navy at St. Petersburg. The armaments are supplied at Cronstadt, and the principal engineering establishment is at Kolpino, on the Eshorra River; there is also a government manufactory of steel, known as the Aboukoffsky Steel-Works, located at Alexandrovsky.

Rutter, or Routier. An old word for a track-chart; it was also applied to the log-book.

Ruyter, Michel Adriaanzoon Van, the justly celebrated Dutch admiral, was born at Flushing in March, 1607, and died of wounds received in battle on April 29, 1676. The word Ruyter signifies, in Dutch, a cavalier, but in this case implies no very long descent, as it is said that the name was given to his grandfather on account of some feat of daring on horseback. The whole story is doubtful. The future admiral early made himself known among his youthful playmates in Flushing for his venturous intrepidity. When a mere child he climbed, by means of the scaffold with which workmen were executing repairs, to the top of the highest steeple in his native town, and seated himself upon the pinnacle. The workmen, not knowing that he was there, took away the scaffold and ladders; but young Ruyter, undismayed, managed to kick holes in the tiles, and to make his own way safely down to the earth again.

His family was poor, and he was early apprenticed to a rope-maker; but by dint of insisting upon going to sea his indentures were canceled, and he attained his desires by being entered as a "boy" in 1618. Four years after that he had the rating of gunner, and as such did good service during the siege of Bergen-op-Zoom by the Spaniards.

Soon after he was made boatswain of a man-of-war, when, in a fight with a Spanish vessel of about equal force, he led the boarders, and was severely wounded in the head. The Spaniards had the best of it on this occasion, and carried the Dutch off prisoners. Ruyter managed soon to escape from his Spanish prison, however, and begged his way across the whole of France, reaching Flushing in a dreadful state from hunger and exposure. After his recovery from these hardships he became an officer of a merchant vessel for a time, but soon returned to the national marine, being placed in command of a vessel fitted out for the purpose of convoying merchantmen on distant voyages. Holland was then in the height of her naval power and successful commerce, which extended to every sea.

Ruyter made several voyages abroad, to Greenland, Brazil, the West Indies, and elsewhere, increasing in experience, and always paying great attention to the study of the sciences of war and navigation.

In 1641, the Portuguese having thrown off the Spanish yoke, and the Low Countries having also revolted, it was natural that the latter should send a fleet to the assistance of the former. Ruyter served in this fleet,—at first in command of a line-of-battle ship and then as rear-admiral.

Upon his return he took command of a heavily-armed merchant vessel on a venture to America. On the voyage he was attacked by a Spanish man-of-war, when Ruyter not only successfully defended himself but sunk the Spaniard. He was by this time well known, having managed to make his name respected and feared throughout maritime Europe. In 1652, after his private voyage to America, Ruyter was placed in command of a fleet, with which he engaged that of the English Admiral Askew. Ruyter undoubtedly had much the best of the action.

In 1654 he was in command of a fleet which was ordered to reconquer the Dutch possessions on the coast of Africa, which had been seized upon by the English. Upon this occasion he made a very important and successful cruise full of very interesting incident, and reflecting great credit upon the Dutch navy and upon himself. Upon his return the States-General made him vice-admiral of Holland,—the highest rank to which a seaman could then attain, as the title of admiral was inseparable from that of stadtholder of the United Provinces.

Ruyter was at this time 47 years of age, and did not fail to prove himself worthy of the high position given him. But he was, about this period, called upon to undergo great trouble, on account of his outspoken sympathy with the brothers De Witt,—patriotic men, who died victims of calumny and popular fury. Admiral De Ruyter was, after their butchery, accused by the enemies which every man of great force of character must have of complicity with the De Witts.

While he was defending his country, in command of the fleet, a dangerous mob was threatening his house and his family. The latter were rescued, not without difficulty, and placed under the special protection of the government. Ruyter himself received many anonymous threats of violence and assassination, to which he paid no attention, and, pursuing the even tenor of his duty, outlived this temporary and unmerited unpopularity.

In 1673 the Low Countries were attacked—by land and sea—by a combination of the most powerful nations of Europe, and their very existence hung in the balance. Their action in this emergency is a model for any people, for they resolved to purchase their liberty, not only by desperate fighting, but by every sacrifice of wealth and comfort. Ruyter was charged with the defense of the coast against the combined fleets of France

and England, and in doing this he fought many general and more partial actions, winning, even from his opponents, the greatest admiration for his abilities and dauntless courage.

Count d'Estrées, the French admiral, wrote to Louis XIV. that "he would give his life for Ruyter's glory." This is rather stilted talk, but serves to show how the Dutch admiral's conduct was considered by his enemies.

When peace came at last Ruyter was past middle age, and, tired of the sea and of battles, wished to spend the remainder of his life with his family. Unfortunately for his design, in 1675 the United Provinces, now at peace with Spain, and favorably disposed towards that power, were requested to send a fleet to aid them against the French in the operations about Sicily, resulting from the revolt in that island against Charles II. As soon as they determined to send a force, the Dutch government insisted that Ruyter should command it; a commission which he accepted with great reluctance. Upon reaching the Mediterranean he had to meet Duquesne, the commander of the French fleet,—a man who, like Ruyter, had risen from very modest beginnings. They had one preliminary and partial engagement, without definite result. But, on April 22, 1676, the two fleets met near Syracuse, and a desperate general engagement ensued. There was great slaughter, and Ruyter was dreadfully wounded in both legs, while, in falling, he seriously injured himself again. In spite of this he refused to be taken below, and, lying upon a mattress, continued to give orders, conducting the retreat which he was forced to make in good order. A few days afterward he died of his wounds. His remains were taken to Holland, and there given a magnificent funeral.

All historians unite in giving Ruyter the highest position, not only as regards courage and professional ability, but moral worth. The great powers of his day held him in high esteem, and, after the battle in which he received his death-wounds, the king of Spain sent for him and his posterity the title of duke, with a considerable pension to support it. It was too late to benefit Ruyter, and his sons were too proud of their father's name to change it for a foreign one, even with an exalted title. So they refused it, as Admiral De Ruyter himself would probably have done. The king of Denmark and Louis XIV. both caused Ruyter's portrait to be painted and placed among those of their own general officers; and when the king of France heard of the admiral's death he exclaimed, "He was a redoubtable enemy; but we are forced to deplore his loss, for the man was an honor to humanity." Such pretty speeches are often put into the mouth of Louis by his historiographers; but it is at least possible that he made this one, for he is known to have had a great admiration for Ruyter. The portrait of the admiral, by Jordaens, shows an immense person, with a head large in proportion,—a little sunk between the shoulders; long hair, parted in the middle and falling on each shoulder; large, well-opened eyes; a Flemish nose, somewhat *retroussée*, and with wide nostrils; a double chin, and a long, fiercely-twirled moustache.—*E. Shippen.*

Ryde. A small stream.

S.

S. An iron hook, bent to that shape; also called a *pot-hook*. In the log-book, *s* indicates *snow*.

Sabander (for *Shah-bander*). The governor of a maritime district in Syria.

Sabine. A small fish, which is sometimes preserved in oil for food.

Sabot. A disk of wood or metal fastened to the base of a spherical projectile to keep it in the proper position while loading. All spherical shell and shrapnel in the navy have sabots, fastened to them by 4 straps of tinned iron, and further secured by a seizing at the base.

Saccade. The flap of a sail in calms and light winds.

Saccoleva. A Levantine vessel with one lateen-sail. A Greek vessel of 100 tons, with a foremast raking very much forward, having a square topsail and topgallant-sail, a sprit foresail, and two small masts abaft, with lateen yards and sails.

Saccopharynx. A genus of eels which have the power of distending the thorax like a sack.

Sackett's Harbor, Jefferson County, N. Y., is pleasantly situated at the mouth of Black River, on Lake Ontario. It has a good and safe harbor, easy of access, and was formerly an important naval station, and there is now one wooden sailing-vessel (the "New Orleans") belonging to the navy on the stocks at this place. It has greatly declined in the last 20 years, although it is becoming a popular summer resort on account of its fine scenery. Madison Barracks, garrisoned by a battery of artillery, are located here.

Sacks of Coal. The *Magellanic clouds*, patches of blue in the southern sky, near the pole.

Sacramento, the capital of California, and the second city in size and importance, is situated on the Sacramento River, at the mouth of the American River, 120 miles by water from San Francisco. Lat. 38° 34′ N.; lon. 121° 26′ W. As a centre of commerce it possesses great advantages, as it is accessible at all times of the year for steamers and sailing-vessels, while both the Sacramento and its important affluent, the Feather River, are navigable for small steamers far above, into the interior of the country, and this city is therefore the entrepôt for supplying the great mining regions of the north. It has also an extensive trade with the great central valley of the State. A large number of mills and manufactories of all kinds are located here,

the machine-shops of the Central Pacific Railroad alone employing over 1000 men. Regular lines of steamers ply daily between here and San Francisco. Pop. 20,000.

Sadalmelik. The star *α Aquarii.*

Sadalsund. The star *β Aquarii.*

Saddle. A notched piece of wood, to support a spar. The bowsprit-saddle receives the heel of the jib-boom. A wooden saddle-crutch sometimes receives the weight of the spanker-boom when not in use. An angular bar of iron on the inside of the bracket of a monitor-carriage.

Safe-conduct. A passport. A privilege granted in war exempting the party receiving it from the effects of the war during the time and to the extent prescribed in the permission. It may be granted either by the sovereign authority in a state or by subordinates in command, who are invested with the power by express commission or as an incident to their official trust. The grantor is morally bound to enforce the privilege against his own subjects or forces, and to make good any damages resulting to the holder by its violation. What is known in the army as a "safe-guard" is analogous to a safe-conduct, and its violation by any person belonging to the armies of the United States in foreign ports, or in the United States during rebellion, is by the 57th of the "Articles of War" made punishable by death.

Safety-keel (*Eng.*). A form of keel designed by Oliver Lang, giving greater security.

Safety-pin. A pin used sometimes to secure the head of the capstan-bar. A pin used in a boat-lowering apparatus to prevent the accidental detachment of the boat. A pin inserted in the tube of Singer's torpedo to prevent premature explosion.

Safety-plug. A leaden plug inserted in the inner end of a navy time-fuze to guard against accidental ignition. A plug of cement or papier-maché, used in torpedoes to prevent explosion during transport. In *mechanism*, a plug inserted in the shell of a steam-boiler or other vessel containing fluid under pressure, so fitted or made of such material as to be forced out or melted when the pressure or temperature is excessive. See Fusible Plug.

Safety-valve. A valve attached to a steam-boiler, which, by automatic action, opens and permits the escape of steam when the pressure exceeds a stated amount. The valve is confined to its seat by a weight or spring adjustable to any given pressure, and is generally provided with mechanism for opening it at will by hand. In the most common form the valve is controlled by a weighted lever. A *lock safety-valve* is one so inclosed that, after having been adjusted by an inspector, it cannot be controlled by the person managing the boiler. The area of opening of the valve should be sufficient to permit all the steam that can be generated by the boiler to escape at a pressure a little above that of the atmosphere. There are many forms of safety-valves, the principal object aimed at in all being to secure certain and prompt action.

Sag. To settle down, or yield to weight or pressure. *To sag to leeward*, to shift greatly to leeward by force of wind, sea, or current.

Sagitta. See Constellation.

Sagittarius, Constellation of (*Lat.* "The Archer"). The ninth constellation of the zodiac, lying between Scorpio and Capricornus. It contains no star above the third magnitude.

Sagittarius, Sign of. The ninth division of the ecliptic, including from 240° to 270° of longitude. Owing to the precession of the equinoxes, the *constellation* Sagittarius no longer occupies the *sign* of this name, the constellation Scorpio having taken its place. The sun is in Sagittarius from about November 23 to about December 22. Symbol ♐.

Saic. A kind of ketch, with very long masts, used in the Levant. Sometimes it has but one mast, sometimes two, and a bowsprit. No top-gallant-sails are used.

Saidak. See Ursa Major.

Saigon, the capital of French Cochin China, is situated on the Saigon River, 35 miles from the China Sea, in lat. 10° 47′ N., lon. 106° 45′ E. It consists of three towns, Pingeh, on the west side of the river, the commercial town, and the native quarter. The citadel, fortified in European fashion, contains barracks, officers' quarters, and the governor's residence. The city has a navy-yard, arsenal, floating docks, with piers and basins for shipping. It has quite a foreign trade, chiefly with Siam and China. Pop. 90,000.

Sailor. A generic term, synonymous with *mariner*, used to designate all sea-faring men. Not all *sailors* are *seamen.*

Sailor's Home. An institution for the maintenance and support of aged and infirm seamen. A Sailors' Home was instituted at Quincy, Mass., in 1866. The Sailors' Home on Staten Island, in New York Bay, is an excellent institution of many years' standing, and there are other institutions of the kind on the coast and on the lakes. Government sailors are given a home at the Naval Asylum.

Sails. The canvas, cloth, or other fabric attached to the yards, gaffs, stays, etc., of a vessel, which, when extended, are acted upon by the force of the wind.

The material in general use is canvas or duck, made of cotton, hemp, or flax. The coarser and heavier qualities of canvas are used in the large sails, where great strength is required, while the light sails, which are intended for use only with moderate winds, are made of the finer qualities.

The breadths of canvas, cut at the required length, are sewed with a flat, double seam, using for the purpose flax or cotton twine, according to the material of which the canvas is composed. The edges of the sail are finished with a broad hem called the *tabling*, and to this is sewed the bolt-rope or *roping*, by which the sail is strengthened and rendered capable of withstanding the heavy strain which is required. A draft of the sail should first be made, showing the number of cloths and the dimensions of each.

When there is sufficient space, as on the floor of a sail-loft, the measurements of the half-plan of the sail may be laid down, and the cloths cut and placed in the position where they are to be sewed.

Sails should be made to set as flat as possible, to enable a vessel to sail near the wind when close-hauled, and in order that the wind may have greater effect upon them. The set of a sail depends in a great degree upon the manner of roping, for if the canvas is too slack the sail

will extend like a bag, and much of the effect of the wind will thereby be lost.

Sails may be divided into two general classes, square and fore-and-aft. The former are quadrilateral, but not necessarily rectangular. They are always fastened or *bent* to the yards, and as the yards decrease in size the higher their position above the deck, each sail is shorter on the upper edge than on the lower. The principal square-sails are called the courses, topsails, topgallant-sails, and royals. On merchant vessels a sky-sail is sometimes carried above the royal. They are also named from the mast to which they belong, as the fore-course, or foresail, the maintop-sail, the mizzen topgallant-sail, the fore-royal, etc. The upper and lower edges are called the *head* and *foot*, and the two sides are called the *leeches*. The ropes which are sewed upon these different parts are also named head-rope, foot-rope, and leech-ropes.

The sails are bent to the yards by means of rope-yarns or spun-yarn passed through eyelet-holes made in each seam at the head of the sail, and secured to a jack-stay on the yard. At each upper corner a strand is worked through two eyelet-holes, around the roping, forming loops called the *head-cringles*, through which small ropes or lashings, called *head-earings*, are passed, and by which they are secured to the yard. The lower corners are called *clews*, and in the larger sails they are fitted with *clew-irons*, to which the tacks, sheets, and clew-lines are hooked.

Reef-bands are strips of canvas sewed across the sail parallel to the head. Eyelet-holes are made through the reef-bands at every seam in which short pieces of rope, called *reef-points*, are fastened, and serve to secure the reef-band to the yard when the sail is reduced in size by reefing. The reefs are called, commencing at the head of the sail, *single* reef, *double* reef, *third* reef, and *close* reef. At each end of the reef-bands, cringles are made, inside of which composition or iron rings (called *thimbles*) are placed.

Reef-earings are used in securing these cringles to the yards when the sail is reefed.

A variety of ropes and tackles are used in handling sails, such as *halliards*, by which they are hoisted; *sheets*, by which the clews are extended to the extremities of the yard next below; *clew-lines* and *clew-jiggers*, *bunt-lines*, *bunt-jiggers*, and *leech-lines*, which are used in pulling the different parts of the sail up to the yard upon which it is bent; *bow-lines*, which steady the leeches when sailing close to the wind; *braces*, by which the yards are moved and placed in such positions that the wind may have the greatest effect upon the sails, and *reef-tackles*, which assist in reefing the sail.

Topgallant-sails are seldom made to be reefed, but they have bunt-lines and leech-lines, while royals, being still smaller, require only clew-lines with which to take in the sail.

Studding-sails are set outside of the leeches of the fore- and main-topsails, topgallant-sails, and royals, and of the foresail. They are all quadrilateral in shape except the lower studding-sail, which is sometimes triangular. They are hoisted to the end of the yards, and the lower part is extended by means of a boom secured on the yard below. They are set and taken in by the halliards, tack, sheet, and down-haul. Studding-sails are named from the masts by which they are supported, as fore-topmast studding-sail, main-topgallant studding-sail, etc. They are used only with a fair wind and in moderate weather.

Fore-and-aft sails are those which are bent to the gaffs or masts, or are hoisted upon the stays. All square-rigged vessels carry fore-and-aft sail. In a ship or bark, the sails which are bent to the gaffs at the foremast and mainmast are called *trysails* or *spencers*, and that at the mizzen-mast is called the *spanker*. The trysails are taken in by means of *brails*, by which the sails are gathered in to the gaffs and masts, the gaffs being stationary. The spanker may be fitted in the same manner, as is usual in men-of-war, or it may be set and taken in by hoisting and lowering the gaff.

All jibs and stay-sails are bent to wooden or iron rings called *hanks*, which pass freely on the stays. They are hoisted by the halliards, hauled down by the *down-hauls*, and *trimmed* or flattened by the sheets. The jibs, fore-topmast stay-sail, and fore-stay-sail are set upon the stays which support the foremast, and are called the *head sails*. They are triangular in shape, but those stay-sails which are set between the masts are usually quadrilateral, and are named from the stays upon which they belong, as main-topmast stay-sail, mizzen-topgallant stay-sail, etc.

The lower forward corner of all fore-and-aft sails is called the *tack*, and the same term is applied to the lower outer corner of a studding-sail, and the weather lower corner of a course. The edge of a stay-sail which lies along the stay is called the *luff* or *stay*. That nearest the stern is called the *leech*, and the lower edge is called the *foot*.

The lower sails of fore-and-aft rigged vessels are named from the mast upon which they are set. A gaff-topsail is nearly triangular in shape, and is set between the topmast and the gaff.

The depth of a course, or the distance from the head to the foot, is called the *drop*. The same dimension of any other square-sail is called the *hoist*, while the width or distance between the leeches is referred to the number of *cloths* or breadths of canvas which it contains.

Various improvements have been made in square-sails by which they may be handled with greater ease with a small number of men, but the only one which is in general use in merchant ships is called the "double topsail-yard rig." By dividing the topsail into two sails, each of which can be set or taken in independently of the other, the work of handling a topsail is greatly reduced, while the same sail-surface can be extended, as in a topsail with a single yard.

Boat's sails are of different descriptions, and vary with the class of boat or the purposes for which it is to be used. Pleasure-boats are rigged with fore-and-aft sails either on one or two masts. The sails are usually of large size compared with the dimensions of the boat, for the purpose of obtaining greater speed.

The different classes of boats in the navy are of a uniform rig.

Sailing launches are *sloop-rigged*, having one mast, upon which are set a jib and mainsail.

Barges and first and second cutters are rigged with two *sliding-gunter* masts, upon which are set two triangular sails, called the foresail and mainsail, and a jib.

A sliding-gunter mast consists of two sections, nearly equal in length, called the lower-mast and topmast. The latter slides upon the former, and is held in position by means of two iron rings or bands secured to the topmast near its lower end. The sail is permanently bent to the topmast, but laced to the lower mast in order that it may not prevent the topmast from being lowered quickly. The sail is set by hoisting the topmast to its place.

Third and fourth cutters have two masts carrying *sprit-sails* and a jib. The sprit-sail is so called from the *sprit* or light spar that is used to raise and keep in position the peak of the sail. The upper end of the sprit is placed in a grommet or loop at the peak, while the lower end rests in another grommet on the lower part of the mast.

Whale-boats are rigged in the same manner with the exception of the jib.

Gigs are furnished with one mast, which carries a sprit-sail, and a stay-sail which extends from the head of the mast to the stem of the boat. Dingeys have one sprit-sail.—*E. T. Strong, Lieutenant U.S.N.*

SAIL-BURTON. A long double purchase, used for hoisting sails aloft, composed of a fiddle-block, a single-block, and a leader made fast at the latter, so that the fall acts as a guy to direct the ascent of the sail.

SAIL-CLOTH. Duck or other canvas used for making sails, awnings, etc. Hemp, cotton, and linen cloth are used in the navy.

SAIL-COVER. A canvas cover placed over a sail when furled, to protect it.

SAIL-HO! A cry given by the look-out, or any one, discovering a sail at sea. Sailors jocularly use the term when they wish to give comrades warning of the vicinity of an officer.

SAIL-HOOK. A small hook with a swivel attached, to hold sail-cloth while it is being sewed.

SAILING DIRECTIONS. Books containing local information respecting various seas and coasts useful for the purposes of navigation. The chief topics are, an account of the winds, currents, tides, with directions how to take advantage of these in making certain passages; notices of dangers, such as rocks and shoals, with directions how to avoid them; descriptions of anchorages and ports, with the appearance and bearings of landmarks for making them; the particulars respecting the light-houses on the coast; memoranda of watering-places, etc.

SAILING-ICE. Loose floating ice separated by appreciable intervals.

SAILING-MASTER was the title of a warranted officer in the U. S. navy as early as 1798. In that year John Fisher was appointed on the 12th of May, and nine others during the year. In the first printed regulations for the U. S. navy, "issued by command of the President of the United States of America," January 25, 1802, among the duties assigned to the sailing-master are "to inspect the provisions and stores," "to take care of the ballast," "to give directions for stowing the hold and spirit-room, trimming the ship, and preservation of the provisions," "to take special care of the rigging," "to navigate the ship and see that the log and log-book are duly kept," etc., etc.,—all of which duties now devolve upon the navigator, or officer next in rank to the executive. In 1813 there were 162 sailing-masters in the navy, one of whom was George Farragut, the father of the late admiral. In 1839 the title was changed to *master*, at which time there were 27 in the service, 11 of whom were in service in 1813. "*Masters in the line of promotion*," taken from the seniors of the grade of passed midshipmen to fill the death vacancies in the old-time masters, were first introduced into the service in 1846. Six were appointed the first year. In 1861 there were 36 of this grade on the active and 1 on the reserved list. In 1862, on the reorganization of the navy, by promotion and otherwise, they were all merged in the grades, and the present rank of master, a commissioned officer intermediate between the lieutenants and ensigns, was created, whose duties are simply those of a watch-officer. There still linger on the retired list 4 of the old-time warranted masters not in the line of promotion.

SAILING, ORDER OF. The disposition of a fleet under sail. It was customarily in three lines, although two were sometimes used. There were three orders of sailing, and an order of convoy and of retreat.

SAILING-ORDERS. Orders to sail in the performance of some duty.

SAILINGS. The different methods of determining a ship's track, of representing it on a chart, and of solving problems connected with it. See NAVIGATION.

SAILING-TRIM. With weights and hull well disposed, a ship is in good sailing-trim, the term having reference to her fitness to perform her best sailing.

SAIL-LOFT. A loft or room in navy-yards or shore establishments where sails are cut and made.

SAIL-LOOSERS. Those men detailed to go aloft at the times indicated, to loose the sails.

SAILMAKER. The person employed in a navy-yard to superintend all cutting, fitting, and other work on sails. A warrant-officer in the navy, charged with the same duties on board ship, receiving from $700 to $1800 a year as pay.

SAILMAKERS' BENCH. A wooden bench used by sailmakers in sewing canvas.

SAILMAKERS' GANG. The gang of men working on sail, etc., either on board ship or in a navy-yard.

SAILMAKERS' MARLINE-SPIKE. A slender iron marline-spike, with a wooden handle, used on bolt-rope work by sailmakers.

SAILMAKERS' MATE. A petty officer of a man-of-war, working at sail-making under the directions of the sailmaker, and having the care of the sails and sail-rooms. His pay is $26.50 per month.

SAILMAKERS' PRICKER. A small iron awl, used by sailmakers to punch holes in canvas; also called a stabber.

SAILMAKERS' SPLICE. A neat tapering splice, used by sailmakers in uniting two ropes of different sizes.

SAIL-MAKING. The art of cutting, sewing, and fitting sails, awnings, and other canvas structures or appendages to a ship.

SAIL-NEEDLES. Large steel needles used in sewing canvas, half their length round in section, the other half pyramidal. There are several kinds, increasing in size and strength as follows: 1, flat-seam needles; 2, tabling needles;

3, large sail needles; 4, repair needles; 5, head-rope needles; 6, small bolt-rope needles; 7, medium bolt-rope needles; 8, large bolt-rope needles; 9, small marline needles; 10, large marline needles.

SAIL-NETTING. A rope netting or a canvas receptacle for a stay-sail, as the fore-topmast stay-sail netting, etc.

SAIL-ROOM. A room below the berth-deck of a man-of-war, where sails and other canvas structures are kept. There are more than one on large ships.

SAIL-TACKLE. See SAIL-BURTON.

SAIL-TRIMMER. One of each gun's crew, detailed to go on deck to trim sails during action upon call.

SAIL-TWINE. Twine used in sewing sails and canvas in general. Two sizes are used, five-fold and four-fold, according to the texture of the canvas.

Saint Cuthbert's Duck. The eider-duck, or *Anas mollissima.*

Saint Helier's is situated on the east side of St. Aubin's Bay, on the south coast of the Isle of Jersey, of which it is the capital. Lat. 49° 11′ 3″ N.; lon. 2° 6′ W. It is located between two rocky heights, on the eastern one of which is the citadel, Fort Regent, overlooking the inner harbor. The town is the residence of many retired officers of the British army and navy. It has an active trade, and is the seat of the representative parliament of Jersey. Pop. 31,000.

Saint John, the commercial metropolis of New Brunswick, is beautifully situated at the mouth of the St. John River, on a rocky peninsula projecting into the harbor. Lat. 45° 14′ 6′ N.; lon. 66° 3′ 30″ W. The harbor is safe, capacious, and never obstructed by ice. The entrance is protected by Partridge's Island, on which are situated a quarantine hospital and light-house. On the east side of the channel a breakwater moderates the force of the waves, caused by southerly gales. This city is the entrepôt for a wide extent of country, and its situation on a large river with a good harbor, with railways running from it in all directions, and having extensive maritime and manufacturing interests, indicates its great commercial importance. It also has large interests in the fisheries. Pop. 29,000.

Saint John's, the capital of Newfoundland, is situated near the extremity of the easternmost peninsula of the island, in lat. 47° 33′ 6″ N., lon. 52° 3′ W. The harbor, an exceedingly good one, is inclosed by two mountains, between the eastern points of which the entrance called the "Narrows" is located. This entrance is well defended by fortifications. It has 12 fathoms of water, but only one vessel can pass at a time. In the harbor proper there is ample room for shipping, with good anchorage. Pop. 23,000.

Saint Malo, in the department of Ille-et-Vilaine, France, is situated on the English Channel, at the mouth of the river Rance. The town is built upon a peninsula, connected by a causeway with the mainland, and is defended by strong bastioned walls and a castle. Among the chief buildings are the chamber of commerce, naval arsenal, and school of navigation. The harbor is secure and commodious, dry at low-water, but 40 feet deep in spring tides. There is also a large floating dock. It has extensive rope-walks, manufactures of fishing-nets and hooks, and marine fittings, an active provision trade with the colonies, a brisk coasting trade, and many vessels engaged in the fisheries. Pop. 11,000.

Saint Paul de Loanda, the capital of the Portuguese province of Angola, in West Africa, in lat. 8° 48′ 1″ S., lon. 13° 13′ E., is situated on a large and secure harbor, sheltered by the island of Loanda, and defended to the seaward by three forts. Its market is well supplied, and it has an export trade in ivory, hides, coffee, and palm oil. It was once the seat of an extensive slave-trade. Pop. 20,000.

Saint Petersburg, the modern capital of the Russian Empire, is situated on both sides of the Neva, at its entrance into the Gulf of Finland, in lat. 59° 56′ N., lon. 30° 18′ E. The city is chiefly located on the south bank of the Neva, and partly on islands in the river. Owing to the flat, marshy soil upon which it is situated the city is badly drained, and is also subject to destructive inundations, during one of which, in 1824, 15,000 lives were lost. The river is open to navigation about 220 days in the year, it being frozen over the remainder of the time. The city contains many scientific schools and academies, an imperial library containing 450,000 volumes, an astronomical and meteorological observatory, naval hospital, school of mines, the imperial academy, and imperial geographical society. Manufactures of all kinds are carried on, and it has imperial gunpowder, tapestry, and porcelain factories, extensive cannon-foundries, and glass-works. It has steam-packet communication with all the principal ports of Europe. The channel at the mouth of the river is impeded by sand and difficult of access, the ship-canal to deep water being not yet completed. It has two dock-yards, and many of the vessels of the Russian navy are built here. Pop. 670,000.

Saint Sebastian, situated on a small peninsula in the Bay of Biscay, in the province of Guipuzcoa, Spain, is a fortified city, inclosed by walls, and defended by the citadel of Mota, on the adjacent height, Mount Urgull. Its harbor, protected by a mole, is small, but the city has a large import trade, and an export trade in corn, etc. Lat. 43° 19′ 2″ N.; lon. 2° 0′ 5″ W. Pop. 10,000.

Saint Servan, France, is in the department of Ille-et-Vilaine, on the right bank of the Rance, at its mouth in the English Channel. It has two harbors, one for frigates and the other for commerce, separated from each other by the rock and castle of Solidor, besides which another fort defends Saint-Servan. It has ship-building docks and an active trade. Pop. 10,000.

Saint Swithin's Day. An old superstition was, that if it rained on this day, the 6th of July, it would rain every day during the next forty.

Saker. An old gun, called in European languages *sacre*, 8 to 9 feet long, and 5 to 12 pounds calibre.

Salamander. A heated iron, formerly used in firing guns, especially in saluting. A lacing of rawhide to confine the luff of a sail to its stay.

Salem, Mass., in the county of Essex, is pleasantly situated on a peninsula formed by two inlets of the sea, called North and South Rivers. It has a good harbor, defended by Fort Pickering. The town had formerly an extensive trade with India, China, Africa, and South America;

but at present the foreign trade is small, although the coasting trade is extensive, the reception of coal for distribution and the shipment of ice being the leading interest. Quite a number of manufactories, principally cotton goods, boots, and cordage, are located here. Pop. 26,000.

Sale of Effects. When a sailor dies or deserts, his effects are sold by auction to the highest bidder.

Salerno, a city and seaport of Italy, capital of the province of Salerno, is situated at the northern extremity of the gulf of the same name, in lat. 40° 40′ N., lon. 14° 46′ E. The port is well sheltered, but is very shallow. Pop. 28,000.

Salinas, or **Salines.** Natural or artificial ponds for salt-making purposes.

Salinometer. A salt-gauge, used to ascertain the density of sea-water in the boilers, acting by specific gravity. A receptacle for holding it and the hot water is called the *salinometer-pot*, and is sometimes affixed to the boiler-front.

Sally. To make a sudden rush in a body from one part of the ship to another. It becomes useful when a ship is aground forward or aft. A *sally* would also be made to clear a certain part of the deck of boarders lodged there.

SALLY-PORT. A large port on either quarter of a fire-ship, serving as a means of escape to the crew after the train is fired. The entering or gangway port of a three-decker, or of a large modern ironclad.

Salmagundi. A sea-dish, made of slices of dried fish mixed with onions.

Salmon. A fish of a yellowish-red color, of the genus *Salmo;* it is found in all the northern climates of America, Europe, and Asia. It ascends the river for spawning in spring, and penetrates to their head-streams. It is a remarkably strong fish, and will even leap over considerable falls which lie in the way of its progress. It has been known to grow to the weight of 75 pounds; more frequently it is from 15 to 25 pounds. It furnishes a delicious dish for the table, and is an article of commerce.

SALMONET. A salmon of small size; a samlet.

SALMON-LADDER. A short trough placed in a water-fall, with passages cut for fish to pass through.

SALMONOID. Belonging to the family of which the salmon is the type.

SALMON-PEEL. A young salmon.

SALMON-TROUT. A small species of *Salmo*, resembling the common salmon in color; called also the *sea-trout*.

Salonica, in Roumelia, European Turkey, is the capital of a sanjak, at the northeast extremity of the Gulf of Salonica. Lat. 40° 38′ 8″ N.; lon. 22° 57′ 22″ E. The bazaars are extensive and well supplied, and the city has some flourishing silk-drawing factories. It is the seat of extensive trade. The exports consist of wheat, barley, maize, timber, sponges, wine, raw silk, etc. Pop. 80,000.

Saloon. The main cabin of a steamer or passenger ship. Passengers there berthed are called *saloon-passengers.*

SALOON-DECK. The deck on which the saloon of a steamer is situated.

Salt. A *salt*, or an *old salt*, is an old sailor whose life has been spent at sea.

Salt-box (*Eng.*). A case in which a temporary supply of cartridges for great guns is kept on deck.

Salt-eel. A rope's end for delinquents.

Salt-horse, or **Salt-junk.** Navy salt-beef; a part of the ration.

Salt-marsh. A marsh subject to the overflow of salt water.

Salt-water Jack. A sailor who navigates the ocean, in contradistinction to a *fresh-water Jack.*

Salute. To honor a superior by raising the cap, presenting arms, dipping colors, manning the yards, or firing a certain number of guns. In the navy, all persons salute superiors by raising the cap. All sentries salute officers below the rank of lieutenant-commander by raising the hand to the rifle at a carry; all of and above that grade, by presenting arms. The ensign is dipped in compliment to foreign men-of-war or forts, in reply to a similar salute. Boats salute according to the rank of those meeting in them, by lying on their oars, tossing, or trailing them, or by letting fly the sheets under sail, or merely by raising the cap, sitting or standing according to circumstances.

Officers on leaving or entering a ship are attended by a boatswain or his mate, and from 2 to 8 boys holding the entering ropes or standing inside the gangway. An admiral, commodore, or captain is received with a guard of marines, and drums are rolled in his honor under certain circumstances. All persons salute the quarter-deck on approaching it, by raising the cap.

Guns are fired when officers of and above the grade of commodore visit a ship, on occasions of ceremony, on national or other holidays, to foreign ships or ports, or on the visit of high civil or diplomatic functionaries. No more than 21 guns are ever fired, and they vary from that number to 5, always being of an odd number. This latter custom is very ancient, an even number being considered unlucky. Salutes are answered gun for gun, or according to the rank of the officer saluting; and the flag of the rank or of the nation saluted is hoisted when the salute is fired, and in case of personal salutes, the jib is hoisted with the first gun, and hauled down with the last. Ships carrying less than 14 guns do not salute.

Salutes. The theory of firing a salute is that it leaves the guns harmless and at the mercy of the other party, and this is so true that firing salutes with blank cartridge is a modern invention, occasioned, however, by the fact that a complimentary cannon-ball once proved fatal to the personage whom it was meant to honor. When an officer salutes he points his drawn sword to the ground, and the salute of troops is still designated "presenting arms,"—that is, presenting them to be taken.

In early times the salutes were an exchange of a few guns, as is the practice in China to-day, where the usual salute is the sensible one of 3 guns only. Edward Skippen, a traveler of the 17th century, writing in 1664, says, "One afternoon while we were at Messina, came into port two Malta gallies hung full of colors, flags, banners, etc., upon the masts, sails, etc., which made a very fair show, which gallies received pratique and then they gave 4 guns, answered by Castle Salvador with 3. Then gave the viceroy 4, who answered also with 3. At last the gallies of Sicily were saluted with 4, who returned their welcome with 3 *shot.*"

Sir William Monson, in his "Naval Tracts," written some time prior to 1600, and the earliest writer on the subject of naval salutes, says at the beginning, "I am sorry I have occasion to complain of the lavish and wasteful expense of powder in saluting ships under a friendly pretence of meeting at sea, more practised of late by our nation than any other." "A castle and the Governor of it is in the nature of a Gentleman that will entertain his Friend at his house and give him a hearty welcome, and because the castle cannot perform it in words, he makes his ordnance speak it for him with such a number of pieces as he thinks fit; after which proportion an Admiral is to answer by way of thanks, but to exceed the number of the castle's salutation, because an Admiral's ship commonly carries three times more pieces than the castle has. This is to be referred to the will of the commander on either side. If an Admiral be accompanied by his Vice-Admiral, Rear-Admiral, and the rest of his Fleet, there needs no other salutation from the castle, for the Lord-Admiral's welcome includes all the rest of his friends and fleet; but notwithstanding a Vice-Admiral must salute a castle with two pieces less than an Admiral, and the Rear-Admiral with two less than he, and this is as much to honor the Admiral as the castle; but it must be considered that these three only that carry the flags of command and rule over the squadrons, and no other ship is to shoot, unless by directions of the Admiral, for their shooting will be taken as too great a familiarity with him.

"When an Admiral shall depart from under the command of a castle, in sign of his loving acceptance for his entertainment both he and his two other flags are to give the same salutation that the castle gave him at his entrance, and with the same number of form as aforesaid.

"If a fleet pass within sight of a castle, and not within command of his ordnance to reach him, the castle is not bound to salute, only to afford a welcome and a visit by a gentleman of quality. If a Governor fail to perform any compliment that is meet, he must amend it upon the Admiral's landing, making his ordnance roar aloud his welcome; but the ship is not to answer, because it is done to the person of the Admiral, who is bound to requite the same upon the Governor's visiting him on board his ship, and his departure from thence."

It is curious to see how these regulations regarding salutes have been continued for near 300 years. Monson continues:

"The saluting of ships by one another at sea is both ancient and decent, though in this latter time much abused; for whereas 3, 5, or 7 pieces may have been the ordinary use for an Admiral, and never to exceed that proportion, and an Admiral not to answer with above one or three, now they strive to exceed that number, thinking that many pieces add honor to the salutation; but the owners of merchant ships would be gladden it might be done with less cost and more courtesy in another kind. But tho' the Admiral cannot restrain this compliment in the ship that salutes, yet he may command his gunner not to return above one or three pieces, according to the old manner.

"And for such ships as are of his own fleet he may prohibit the saluting of one another, but upon the occasions following, viz., in bringing good and fortunate news against an enemy after an escape of a desperate danger, and then not to an exceed three or five, and to be answered at the discretion of the Admiral.

"The excessive banqueting on board is a great consuming of powder, for as men's brains are heated with wine, so they heat their ordnance with ostentation and professed kindness at that instant, and many times not without danger; and therefore, to take away the cause, a captain should have directions from under the hand of a General to forbid shooting, which would be a good excuse and give his guests satisfaction, unless it be done in the manner following as I have devised.

"The vain drinking of Healths is another means to waste powder, which a General must likewise forbid, except it be the health of a free Prince, or men of that rank and condition, and then not to exceed one piece when the health shall be begun. The King's, the Queen's, or their issues, is exempted from this strictness.

"Upon some occasion an Admiral may command his whole fleet to fire their guns, as namely, when a foreign Prince, Governors of countries, Ambassadors of great Potentates, and men of Great Blood and Quality, shall be either transported, or make a visit on board the Admiral to behold the stateliness of his fleet, it were necessary they were as well resolved of their force, as the report they would make of their welcome; and in that case every ship of the Fleet is to shoot their whole number of pieces distinctly and orderly (as thus): An Admiral and his squadron first to begin; the Vice-Admiral to follow his example, and so the Rear-Admiral to do the like, but with this caution, that no small ship or pinnace do mingle themselves with great ships, but to second one another according to their Ranks and greatness.

"To come now to my proposition how things should be carried, it is thus: That upon drinking of healths, or leaves taken on board ships, instead of the excessive charge of burning powder out of great ordnance, it may be done with muskets; for a man's welcome consists not so much in the difference betwixt a cannon and a lesser piece, but in the loving heart of him who invites; both the one and the other are consumed in the twinkling of an eye, and the report of a Faulconet, when there is no greater piece, is all one to the hearer as if it were a cannon or faulcon.

"Therefore, to accommodate this difference, and to bring it to a certain custom in the King's ships hereafter, I wish that instead of the chargeable waste of powder that is now in use, by shooting out of great ordnance, to have a number of musketery placed, and decently armed and apparelled soldier-like, upon the upper deck, that when there shall be occasion to drink healths, or to take their leave at departure, they fire their muskets at a mark, made like the shape of a man, put into a barrel, off at sea within point-blank, where the soldiers shall take their aim duly. This will be an act of more pleasure and delight to the beholders than the other, where nothing is expected but the falling of a bullet having no object to shoot at; the eye, the ear, and sense, are all in action and employed together, and many other benefits arise by it; for the soldier will by this practise be made a perfect shotsman

against he shall encounter the enemy, and with so small a cost and charge that a cartridge of a cannon will entertain persons of good rank, and give them as great satisfaction with these few muskets as the number of cannon will do; for the ear is only pleased with the report a cannon makes, which lasts no longer than a flash of powder; no Gunner is made more perfect in his art, for he shoots at random in the air without level."

Not a bad idea this of the ancient marine, to combine usefulness with the observance of etiquette, which may not be amiss for modern sailors to profit by.

In 1688, Sir Cloudesley Shovel, writing from on board the "James Galley" to Sir Martin Wescomb, says, "I shall ever be carefull in keeping especially my Royal orders, which positively command me to salute neither garrison nor flagge of any forrainer, except I am certaine to receave gunne for gunne."

Salvage. An allowance made for goods saved at sea. The party saving such goods has a lien on them, and a reasonable satisfaction is made for such services. Salvage is a comparatively recent institution, unknown to the ancients, and first established by the laws of Wisby, Oleron, etc., in the 13th century. Salvage is not allowed to a government vessel. The rate of salvage varies with the danger incurred, the labor and peril of saving the goods, etc. From one-tenth to one-half the value of the property has been allowed. The crew of a ship and the passengers are entitled to no salvage for saving her. Salvage is usually provided for by insurance, and the salvage is paid by the company, except in case of high charges.

SALVAGE LOSS. The amount that the underwriters pay on property lost at sea.

SALVAGER. A wrecker who receives salvage for goods reclaimed from wrecks.

SALVOR. The claimant for salvage-money for goods saved from wreck.

Salvo. A simultaneous discharge of several pieces.

Samakeen. A Turkish coasting-trader.

Samarang, near the mouth of the Samarang River, on the north coast of Java, in lat. 6° 57′ S., lon. 110° 27′ E., is a well-built city of 60,000 population. It has a large church, military school, hospital, and an extensive trade. Its harbor is not good, and the town is unhealthy, and owes its importance to the adjacent country, which yields large quantities of coffee, pepper, rice, and tobacco. It is the residence of the Dutch governor, and the seat of one of three principal law courts of Java.

Sambucco. An Arab pinnace, used on the east coast of Africa.

Sampan. A Chinese boat, 12 to 15 feet long, with a house on it, used in the interior waters of China. All small boats are now called sampans by foreigners.

Samphire. A sea plant, antiscorbutic, the *Crithmum maritimum*.

Samshoo. A spirituous liquor, distilled in China from the yeasty fluid in which boiled rice has fermented under pressure.

Samson-post. A strong post, extending from the deck-beam to the keelson of a merchant ship, having steps cut in it, by means of which the hold is entered. A large stanchion placed diagonally on each side and against the deck-beam, its lower end being tenoned and made to ship and unship. It was formerly used to bring the fish-tackle to, when fishing the anchor; a single block was lashed near its middle to form a lead for the tackle-fall.

Sandal. A long, narrow boat of 15 to 50 tons, open, and fitted with two masts, used on the Barbary coast.

Sand-eel. A small eel-like fish (*Ammodytes tobianus* and *A. lancea*). It buries itself in the moist sand after the retiring of the tide, and is often dug out for bait and for food. *A. lancea* is the more common, and is known as the *launce*, or *sand-launce*.

Sand-flea, or Sand-hopper. A small amphipod crustacean, found on sandy shores, jumping like a flea.

San Diego, a port of entry in San Diego County, Cal., on a beautiful bay of the Pacific Ocean, 15 miles from the Mexican frontier, in lat. 32° 41′ N., has a good harbor formed by San Diego Bay. There is a depth of 22 feet of water on the bar at low-tide. Hides, whale oil, and wool are the principal articles of export, and it has quite a considerable trade. This city will probably be the terminus of the Southern Pacific Railroad.

Sand-launce. An eel-like fish, the *Ammodytes tobianus*, which buries itself in the sand.

Sand-piper. A wading-bird of the *Totanus* and *Tringa* genera.

Sand-pride. A very small species of lamprey, rarely exceeding 3 inches in length, found in the rivers of England and Scotland; called also *sand-prey*.

Sands, Benjamin F., Rear-Admiral U.S.N. Born in Maryland. Appointed midshipman from Kentucky, April 1, 1828; attached to sloop "Vandalia," Brazil Squadron, 1830–32; in sloop "St. Louis," West India Squadron, 1833–34.

Warranted as passed midshipman, June 14, 1834; on the coast survey, 1836–41.

Commissioned as lieutenant, March 16, 1840; in the frigate "Columbus," Mediterranean Squadron, 1842–44; on special duty in 1845; at Naval Observatory, 1846; Home Squadron, 1847; passage up Tabasco River, and at Tabasco, June 15, 1847; in sloop "Yorktown," and commanding brig "Porpoise," coast of Africa, 1848–50; on coast survey, 1851–55.

Commissioned as commander, September 14, 1855; continued on coast survey, 1855–58; in Bureau of Construction, 1859–60; commanding coast survey steamer "Active," 1861–62.

Commissioned as captain, July 16, 1862; commanding steam-sloop "Dacotah," North Atlantic Blockading Squadron, in 1863; in engagement at Fort Caswell, February 23, 1863; commanding steamer "Fort Jackson," North Atlantic Blockading Squadron, 1864–65,—present at both attacks upon Fort Fisher; on blockade of Wilmington, most of the time, senior officer commanding that division, from November, 1862, to February, 1865; commanding division on blockade of coast of Texas, from February to June, 1865. The surrender of the rebel trans-Mississippi forces to Gen. Canby, U.S.A., was signed by Gen. E. Kirby Smith and Major-Gen. J. Bankhead Magruder, June 2, 1865, and formal possession taken of Galveston by Capt. Sands, commanding division off coast of Texas, by hoisting our flag over the last foothold of rebellion.

Commissioned as commodore, July 25, 1866; at navy-yard, Boston, 1865–66; superintendent Naval Observatory, Washington, 1867–73.

Commissioned as rear-admiral, April 27, 1871. Retired February 11, 1874.

Sand-shot. Shot of coarser kind, cast in sand-molds.

Sands, Joshua R., Rear-Admiral U.S.N. Entered the navy as acting midshipman, September, 1812, and was at once employed under Commodore Chauncey on Lake Ontario. On the 5th of November was put under fire of the enemy in an attack of the "Royal George," which ship was compelled to retire from the fire of the American squadron to Kingston, where, protected from the batteries on shore, no further efforts were made to capture her. April, 1813, he joined sloop-of-war "Madison," and was present at the capture of Little York (now Toronto); carried orders during the greater part of the attack, from the commodore to the different vessels of the squadron, while engaged with the forts and batteries, until the enemy surrendered. May, same year, was engaged with the enemy at the capture of Fort George, Upper Canada; then served on board the sloop-of-war "Pike"; engaged several times the British squadron under Sir James Yeo; 26 men killed on board the "Pike" in one of them; served on shore in a battery on opening campaign, 1814; was ordered to join frigate "Superior," and served on board until peace was proclaimed in 1815; then ordered to the "Washington," 74 guns, bound to Mediterranean; served in her until 1818, when promoted to a lieutenant; in 1819, was ordered to sloop-of-war "Hornet," coast of Africa and West Indies; in 1821, ordered to the "Franklin," 74 guns, Commodore Stewart, employed on the Pacific until 1824; 1828, ordered to sloop-of-war "Vandalia," serving on the coast of Brazil; 1830, returned to the United States, and was variously employed on shore-duty, recruiting, etc.

1840, promoted to the rank of commander; 1841, attached to the New York Navy-Yard until 1843, then ordered to command the "Falmouth," and served in her in the years 1843–45, in the Gulf of Mexico and West Indies; 1846, was ordered to command the steamer "Vixen"; served in her in the capture of Alvarado, Tabasco, and Lagona, of which was made governor, and remained until withdrawn to take part in the attack of Vera Cruz; engaged with the castles from Point Horwas until ammunition was expended; having been supplied by the commodore, put out in front of enemy's batteries and castles in company with steamer "Spitfire" and 4 gun-boats, and remained under fire of the castle until ordered to retire by Commodore Perry; commanded the steamer "Vixen" at the capture of Tampico and Tuspan; 1847, was intrusted with the flags, trophies, and brass cannon taken from the castles, and sent home with dispatches with complimentary letter to the Department; returned to the United States in the sloop-of-war "St. Mary's," in 1848; 1848, was ordered to command the "North Carolina," and remained in her two years; 1851, ordered to command the frigate "St. Lawrence," sailed in her to World's Fair in England, subsequently visited Portugal, and returned to the United States same year; in 1853 was ordered to command the "Allegheny" for Japan,—she proved to be a failure, and was never after employed; 1856, ordered to command frigate "Susquehanna," visited Central America, Mediterranean, and England; was engaged in her laying the cable in 1857; rejoined the Mediterranean Squadron, and was again ordered to Central America, where having laid for some months in the Nicaraguan River, captured part of the filibusters and their steamer, which was left by Commodore Paulding, to whom they were sent, and then forwarded to New Orleans; while in the river, was visited with the yellow fever, and was compelled, for the want of medicines, to sail for Port Royal, Jamaica, where, after arrival, landed 83 patients, and after taking in coal, some 30 more were landed and left in the hospital; the ship now being entirely demoralized as a man-of-war, it was determined to return to the United States, and landed at New York in 1858; 1859, ordered to command the U. S. Squadron (flag-ship "Congress") on the coast of Brazil, and remained until the breaking out of the Rebellion in the United States in 1861. Retired December 21, 1861.

1862, was commissioned a commodore, and was engaged until 1866 on light-house duty on the Lakes Erie and Ontario, and St. Lawrence River, in which year was commissioned a rear-admiral; 1869, was appointed port-admiral, at Norfolk, Va., where he was stationed until 1872.

Sand-smelt. A small fish of the mullet family, and of the genus *Atherina* (*A. presbyter*).

Sand-star. A star-fish of the *Ophiura* genus, with long, slender arms.

Sand-strake. The garboard strake.

Sandusky is a port of entry and the capital of Erie County, O., and is pleasantly situated on the south shore of Sandusky Bay, in lat. 41° 27′ N., and lon. 82° 45′ W. In all seasons of the year except winter the wharves are thronged with steamboats and other vessels loading and unloading their cargoes. The harbor is a very fine one, and the city has an extensive trade. Its chief articles of export are cured fish, wool, wheat, flour, grapes, apples, and wine. Pop. 14,000.

Sand-warpt. Left on a sand-bank by the ebbing tide.

Sandwich, one of the Cinque Ports of England, County of Kent, on the south bank of the Stour, 2 miles from its mouth, in the Pegwell Bay. The town was formerly the seaport of London, but at present it has little trade, the chief exports being agricultural produce, wool, malt, bark, etc., and the principal import coal. Pop. 4000.

San Francisco, the commercial metropolis of California and most populous city on the Pacific coast, is situated on the west shore of the magnificent bay of the same name, about 6 miles from the ocean, in lat. 37° 47′ 35″ N., lon. 122° 24′ 15″ W. The city was originally built around a semicircular bay, having Rincon Point on the south and Clark's Point on the north, these two points being about a mile apart; all the space between is now filled up, the warehouses and wharves being supported by piles driven into the water. The whole business part of San Francisco is toward the city front. The most remarkable buildings are the new city hall, the custom-house, the grand opera-house, merchants' exchange, the Palace Hotel, Occidental

Hotel, Lick House, the mint, and the Bank of California. This city possesses the only large, deep, and secure harbor on the Pacific coast between Victoria and Mazatlan, except that of San Diego, and owing to this and its facilities for communication with the interior, it enjoys a monopoly of the commerce of the Pacific slope. About 50 ocean-steamers run in regular lines between this port and China, Australia, Japan, Panama, Mexico, Puget Sound, and Victoria. The harbor has an entrance 35 feet deep at low-tide, and is connected with the ocean by a strait called the Golden Gate. The chief articles of export are the precious metals, wheat, flour, wine, quicksilver, wool, barley, lumber, and hides. The total value of the yearly exports is about $75,000,000. The number of sea-going vessels that arrive each year at this port is about 4500, measuring nearly 2,000,000 tons. The city has manufactures of silk goods, cigars, furniture, boots, shoes, carriages, glass, candles, iron-castings, woolen goods, etc. At Hunter's Point, 4½ miles from the city hall, is a dry-dock hewn out of the solid rock, and said to be one of the best in the world. The entrance of the harbor is defended by Fort Point, and there is also another fort on Alcatraz Island, 2 miles north of the city. Population, according to the census of 1880, 227,350.

Sangaree. A West India punch, blood-red in color.

San Juan de Puerto Rico, the principal city and seaport of the island of Porto Rico, is situated off a small island on its north coast, in lat. 18° 29′ N., lon. 66° 7′ 2″ W. It is fortified and walled, and is one of the most healthful towns in the West Indies. The harbor is defended by forts and very safe. Pop. 27,000.

San Miguel, a harbor of the United States of Colombia, is an inlet in the Gulf of San Miguel, having an entrance 6 miles wide, and extending about 8 miles inland, with soundings in from 8 to 15 fathoms. It communicates at its inner part with Darien Harbor through two passages. Darien Harbor has a depth of from 9 to 14 fathoms at low-water, is about 16 miles long by 6 miles broad, and completely sheltered. These two harbors have been pointed out as furnishing an eligible termination to a tidal interoceanic canal between the Atlantic and Pacific.

Santa Cruz de Teneriffe is the capital of, and chief commercial port of, the Canary Islands. Lat. 28° 28′ 12″ N.; lon. 16° 14′ 48″ W. The harbor is very secure, with a capacity for 10 or 12 vessels of war. It has a mole of modern construction, which reaches far out into the sea. The coast is commanded by forts and various redoubts. Wine, brandy, almonds, and cochineal are exported. The chief industry of the place is building fishing-boats and loading and unloading vessels. Pop. 15,000.

Santander, capital of the province of Santander, Spain, in lat. 43° 28′ N., lon. 3° 41′ W., is situated on a headland on the Bay of Biscay. It has a large and secure harbor, with good anchorage and shelter, and a mole and docks, and it is the terminus of a railway to Madrid. It is a busy and thriving place, and has a cigar-manufactory, a foundry, brewery, cooperages, fish-curing establishments and tanneries, and various other industries. Pop. 31,000.

Santiago de Cuba, the second city in rank and population of the island of Cuba, on the river Santiago, 6 miles from its mouth, in lat. 19° 55′ 9″ N., and lon. 75° 50′ W., is a well-built city, with wide streets; but, being hemmed in by mountains, it is unhealthy. Its harbor, 4 miles long, is well sheltered, defended by several forts, and deep enough for large ships. In commercial importance it ranks next to Havana and Matanzas. Pop. 45,000.

Saraband. A forecastle dance, imported from African Moors.

Sardan, or **Sardel.** A sardine.

Sardine. A Mediterranean fish of the herring family (*Engraulus meletta*), about the size of the anchovy; often prepared or put up with olive oil as a delicacy. A nickname for a worthless fellow.

SARDINIÈRE. A small boat, having two lug-sails, used in the sardine-fisheries.

Sargasso Sea. From the Spanish *sargazo*, sea-weed. There are two spaces of ocean commonly known to navigators as Sargasso Seas. That in the North Atlantic, which is in places so densely covered with sea-weed as to actually impede the progress of ships, may be roughly defined as lying between the 20th and 70th meridians, and extending from 3 to 5 degrees on each side of the tropic.

The Sargasso Sea of the Pacific extends from about 140° to 175° W., and from the tropic to 40° N. Similar collections exist in the South Pacific and Southern Indian Oceans, but are of less importance to navigators, consisting principally of the giant kelp (*Macrocystis pirifera*).

The pelagic weed called gulf-weed—*Fucus natans*, or *Sargassum baccifernum*—forms the bulk of the Atlantic "Sargasso Sea," together with another variety, almost as plenty, called *Fucus vesiculosus*. These are both of a uniform brown when preserved, but when fresh their color is of a bright yellow, or chrome, contrasting beautifully with the intensely blue clear water in which they float, for they occupy the deepest portion of the Atlantic. These weeds all live attached to rocks, in certain places, as well as free, but are said *only to produce spores when attached.*

The pelagic varieties multiply by simple growth and subdivision, favored by the placid seas in which they float.

The Sargasso Sea has a fauna of its own, being inhabited by small fish of the angler family (*Antennarius*), which makes of the weed a globular nest, as large as a Dutch cheese, glued together by a gelatinous secretion of the fish itself, in which is contained the spawn. Peculiar small shrimps and crabs, and a planarian worm, swarm in the weed, as well as small turtles, membrani pores, mollusks, medusæ, and various marine insects. Besides these, small flying-fish (*Dactylopteri*) find there a secure retreat from their many enemies. All these are colored so as to blend with the colors of the weed, even to being marked with white spots, exactly resembling the older and darker pieces of the weed, which are covered with patches of membrani pores. Thus from year to year and age to age a peculiar flora and fauna are propagated in the very centres of the deepest parts of the ocean.—*E. Shippen.*

Sartori, Louis C., Commodore U.S.N. Born in New Jersey. Appointed from New Jersey, February 2, 1829; attached to ship "Warren" and schooner "Enterprise," Brazil Station, 1831–33;

frigate "Constellation," Mediterranean Squadron, 1834; frigate "Constellation," West Indies, 1835; ship "Natchez," West Indies, 1836–37.

Promoted to passed midshipman, June 14, 1837; navy-yard, Philadelphia, 1838; frigate "Constitution," Pacific Squadron, 1839–41.

Commissioned as lieutenant, September 8, 1841; receiving-ship "North Carolina," New York, 1842; receiving-ship, Philadelphia, 1843; ship "Plymouth," Mediterranean and Brazil Squadron, 1845–46; bomb-schooner "Stromboli," Mexican war, 1847–48; at the capture of Tabasco; Mediterranean Squadron, 1849–52; on board steamer "Alleghany," frigates "Constitution" and "Independence"; receiving-ship "Pennsylvania," Norfolk, 1853; Naval Asylum, Philadelphia, 1853–54; ship "John Adams," Pacific Squadron, 1855–56; commanded expedition and engagement against the Fejees, 1855; navy-yard, Philadelphia, 1857–58; commanding steamer "Water-Witch," West Indies, 1859–60.

Commissioned as commander, April 7, 1861; commanding steamer "Flag," Blockading Squadron, 1861; commanding receiving-ship "Ohio," Boston, 1862; commanding steamer "Florida," North Atlantic Squadron, 1862; commanding ship "Portsmouth," West Gulf Squadron, 1863–65; commanding steamer "Agawam," North Atlantic Squadron, 1866.

Commissioned as captain, September 26, 1866; commanding steamer "Ossipee," Pacific Squadron, 1868–69; commanding steamers "Saranac" and "Lackawanna," 1870; commanding naval rendezvous, San Francisco, 1871–72.

Commissioned as commodore, December 12, 1873. Retired June, 1874.

Sasse (*Eng.*). A fish-weir with a movable gate. A sluice or lock in a navigable river.

Satellite. A secondary planet. It is of the same nature as the primary planets about which they revolve. Nearly all the planets have one or more satellites; they are generally called *moons*, but this name is properly applied to the earth's satellite only. See MOON, PLANET.

Saturn. The planet next beyond the orbit of Jupiter; it shines with a steady, silvery light, like a star of the first magnitude, but does not twinkle. In the telescope its system of rings and satellites forms a magnificent display. There are at least two rings and eight satellites, the distance of the satellites from the primary varying from 120 thousand to 2300 thousand miles. Mean distance from sun, 905 millions of miles; length of solar day, $10^{h}\ 29^{m}$; diameter, 77,000 miles; apparent diameter, 18″; symbol ♄, representing a rude scythe.

Saucer of the Capstan. An iron saucer-shaped socket let into the step of the capstan, in which the spindle plays.

Saucer-headed Bolts. Bolts with very flat heads.

Saucisson. A powder-hose, of tarred canvas or of leather, formerly used to fire the magazine of a fire-ship.

Saugue. A small Mediterranean fishing-boat.

Saury. A fish of the genus *Scomberesox* (*S. saurus*), belonging to the pike family.

Sauve-tête. A splinter netting.

Savannah, Chatham County, Ga., is the largest and most important commercial city of the State. It is situated upon the right bank of the Savannah River, 18 miles from its mouth, in lat. 32° 5′ N., lon. 81° 8′ W. The principal buildings are the custom-house, court-house, city exchange, cotton exchange, masonic temple, and Armory Hall. The harbor is one of the best on the Southern coast, and the river is navigable for steamers to Augusta. There is on the bar a depth of water of 22 feet, and vessels drawing 19 feet can come to the wharves. Steamers run regularly to New York, Boston, Philadelphia, Baltimore, and other ports. The chief articles of export are cotton, rice, lumber, and naval stores. As a cotton port it ranks second in the United States. Pop. 36,000.

Save-all. A small sail formerly set beneath other sails to catch the wind passing under them.

Saw-bill. The goosander, *Mergus merganser.*

Saw-bones. A jocular title for the surgeon.

Saw-fish. A cartilaginous fish of the genus *Pristis*, closely allied to the sharks. It has the upper jaw prolonged into a long beak or snout, with teeth arranged along both edges. It sometimes attains the length of from 12 to 15 feet, and is one of the most formidable enemies of the whale tribe.

Sayth. A coal-fish three years old.

Scabbard. A leather or metal case for a sword or bayonet.

Scald-fish. A fish, the *Rhombus arnoglossa*, allied to the turbot.

Scaldings! A cry, used by sailors to clear the way about decks, intimating that there is danger from hot water.

Scale. A graduated bar, rod, or plate, for measuring or indicating short distances; as, a *drawing scale*, the *scale* of a thermometer, etc. A stony deposit, composed principally of salts of lime, formed on the interior surfaces of steam-boilers, in which sea-water, or water holding mineral salts in solution or suspension, is used.

SCALING-TOOLS. Tools for removing scale from the interior of steam-boilers. The principal ones are small hammers, chisel-shaped at both ends, called *scaling-hammers; chisel-bars*, which are bars of iron of assorted lengths having steel chisels wrought upon their ends; *tube-borers; scrapers;* and *rakes* or *hoes* for removing loosened scale. In addition to these, there are many devices adapted to special purposes.

Scampavia. A Neapolitan galley, or war-boat, pulling from 20 to 40 oars, with 2 lateen-sails and a jib, setting on a spit that veered abeam when the 6-pounder brass gun was fired ahead.

Scandalize. To lower a sail and haul out the reef-tackles without slacking the sheets or tying reef-points. Usually done to the mizzen-top-sail when before the wind.

Scant. Applied to a wind that heads a ship off so that she can hardly lie her course, with yards braced up sharp. *Scant timber* is that which is barely convertible to the purpose designed.

Scantling. The dimensions of a piece of timber, with regard to its breadth and thickness.

Scar. A steep cliff. Rocks bare at low-water. Gravel- or stone-beds in rivers.

Scarborough, a seaport town of England, York County, North Riding, on a headland extending into the North Sea, in lat. 54° 17′ N., lon. 0° 23′ 5′ W. It is much frequented for sea-bathing and for its mineral waters. Scarborough harbor is used as a place of shelter from the easterly

gales, is easy of access, and safe and commodious within. The bay is protected on the northeast by a high promontory. The town has a limited foreign trade, and large coastwise traffic. Pop. 25,000.

Scarbro' Warning (*Eng.*). Letting anything go by the run, without singing out.

Scarf. A joint uniting two pieces of timber. These are of various kinds, according to the location of the timbers so joined.

SCARF-BOLT. A bolt driven into a scarf; also, a bolt used for securing the false keel in wooden ships.

Scarlet-fish. A certain Chinese fish; the telescope carp. So called from its red colors.

Scat. A quick-passing shower of rain.

Scaup. The pochard, or diving-duck (*Fuligula marila*).

Schedar. The star *α Cassiopeiæ*.

Schenck, James F., Rear-Admiral U.S.N. Born in Ohio, June 11, 1807. Appointed from Ohio, March 1, 1825; sloop "Hornet," West India Squadron, 1829; frigate "Brandywine," 1830.

Promoted to passed midshipman, June 4, 1831; sloop "John Adams," Mediterranean Squadron, 1833–34.

Commissioned as lieutenant, December 22, 1835; sloop "St. Louis," West India Squadron, 1837; brig "Dolphin," Brazil Squadron, 1840; razee "Independence," Home Squadron, 1843; frigate "Congress," Pacific Squadron, 1846–47. During the war with Mexico, Lieut. Schenck, as chief military aid to Commodore Stockton, landed and took possession of Santa Barbara and San Pedro, in California; serving in same capacity, marched on and was at the first capture of Los Angeles. As second lieutenant of the frigate "Congress," was at the bombardment and capture of Guaymas and the taking of Mazatlan. Frigate "Congress," East India Squadron, 1848; commanding mail steamship "Ohio," 1848–52.

Commissioned as commander, September 14, 1855; commanding receiving-ship, New York, 1848; commanding steamer "Saginaw," East India Squadron, 1860–61. On June 30, 1861, the "Saginaw" was fired upon by a fort at "Quin Hone," Cochin China; the fire was returned and the fort silenced.

Commissioned as captain, 1861; commanding frigate "St. Lawrence," Blockading Squadron, 1862.

Commissioned as commodore, July 2, 1863; commanding steam-sloop "Powhatan," North Atlantic Squadron, 1864–65; commanded "Powhatan" and third division of Porter's squadron in the two attacks on Fort Fisher; commanded Naval Station, Mound City, Ill., 1866. Retired June 19, 1869.

Commissioned as rear-admiral, July, 1870.

School. A shoal of fish, or whales.

Schoolmaster. A petty officer in the navy, whose duty is to instruct boys.

School-ship, Nautical. A vessel commissioned under special laws for the instruction and training of boys and young men in practical seamanship and navigation.

Nautical school-ships may be established at any of the principal ports of the United States under the act of Congress of June, 1874, which allows the detail of sailing-vessels of the navy for that purpose, the vessels to be commanded and officered by naval officers, but organized and supported by the local authorities. The purpose of this act is to promote nautical education and benefit the national commerce. Such schools should be established, and as soon as possible, since ships of every class will always need skilled ready seamen, whether under sail or steam, and the duties of the seaman can be learned only by practical experience under canvas.

While gales of wind and currents are encountered at sea, the ship having the best trained and organized crew will make the best passages from port to port, and deliver her cargo in better order than vessels manned by inferior crews.

The necessary instruction to form such crews for our ships can best be given on board vessels specially intended for this service, where a system of daily drills is pursued, and where more time can be given to training boys in the duties of a seaman than would be possible in the ordinary routine of duty of a man-of-war or merchant ship making passages at sea.

The organization of a nautical school-ship should be carefully considered, as upon the character and ability of the officers and men will depend almost entirely the discipline and efficiency of the future seamen.

The duties are peculiar, and require not only high professional attainments, but also patience, good temper, and a quick appreciation of the natures and feelings of the boys who are under instruction. These qualities are absolutely essential to the commanding officer, and no one should be assigned to such duty who does not possess them in a high degree, and who is not impressed with the importance of the objects to be accomplished.

There should be a number of officers, large enough to perform all the duties of the ship at sea, and at the same time act as instructors. The graduates from the Naval Academy could be assigned to this duty with advantage, as they would be benefited in the practical exercise of professional duties while imparting to others the theoretical knowledge they obtain at that institution.

A few thorough seamen of intelligence and good character should be employed to fill the more responsible positions on board, and to act as assistants to the commissioned officers in matters of detail, squads of boys being assigned to them, and for whose conduct they should be accountable.

The discipline enforced should be firm and consistent, but as far as possible kind, and no severe punishments should be inflicted unless absolutely essential. The attention of officers and men should be directed rather to the prevention of breaches of discipline than to their detection and punishment. Uniforming the boys and putting them as far as possible in positions of trust, will be found a valuable aid in preserving the discipline on board, and should be resorted to where practicable.

The course of instruction should include not only all the duties of a seaman, from knotting and splicing to handling ship in a gale or working off a lee-shore, but also the branches of an ordinary common school course.

The length of time to be spent on board a nautical school-ship would vary, of course, with the

aptitude and intelligence of the boys themselves, and of this the instructors could best judge.

The greater portion of each year should be spent actually at sea, without regard to the seasons, as while it would not be advisable to expose mere boys to all the hardships incident to a life at sea, they should be made familiar with the management of a vessel under all circumstances, from a calm to a heavy gale.

The "St. Mary's" is now in commission as a nautical school-ship, under the management of the Board of Education at New York, and is performing highly valuable service. The "Jamestown," the vessel detailed for duty at San Francisco, was withdrawn after three years' service. No other nautical schools have yet been established.—*Henry Glass, Commander U.S.N.*

Schooner. A class of vessels first invented by Capt. Andrew Robinson, of Gloucester, Mass., in 1713. The name is derived from their swift motion through the water, the word *scoon* meaning to skip over the water. These vessels are all fore-and-aft rig, and have from two to four masts. They vary in size from 50 to more than 1000 tons. A *topsail-schooner* carries a square fore-topsail and topgallant-sail. Sometimes a schooner sets a flying square foresail in addition to her fore-and-aft sail. A *Ballahou schooner* has the foremast raking forward. *Three-masted schooners* are in common use in America, and several *four-masted schooners* are on trial. Schooners lie nearer to the wind than square-riggers, are less costly, and require fewer men to handle them, and hence are generally adopted for coasters.

Schout. A Dutch water-bailiff.

Schreight. A kind of fish.

Schultze's Powder. See EXPLOSIVES.

Schuyt. A Dutch galiot, short and round, used in the river trade.

Scitie. A small Levantine boat with three lateen-sails.

Scobs. Droppings from the blacksmith's forge.

Sconce. The head. A magazine-lantern.

Scoodyn. The furring on a vessel's foul bottom.

Scope. The length of cable by which a ship rides. This varies with the kind of bottom, nature and force of wind and tide, etc., but should never be less than three times the depth of water in which the anchor is dropped.

Score. The groove around a block in which the strap lies.

Scorpio, Constellation of (Lat. *scorpio* or *scorpius*, "The Scorpion"). The eighth constellation of the zodiac, lying between Libra and Sagittarius. The principal star, *Antares*, may be found by joining Spica with the South Balance (*α Libræ*), and continuing the line to about the same distance. *α Scorpionis* (*Cor Scorpionis*), Antares.

Scorpio, Sign of. The eighth division of the ecliptic, including from 210° to 240° of longitude. Owing to the precession of the equinoxes, the *constellation* Scorpio no longer occupies the *sign* of this name, the constellation Libra having taken its place. The sun is in Scorpio from about October 24 to about November 23. Symbol ♏.

Scorpion. A certain sea-fish. The sea-scorpion.

Scot, or Shot. A fair share or proportion. Hence, *to pay his shot* is to furnish his share of expenses.

Scotchman. A piece of wood or stiff hide placed over shrouds and other rigging, to prevent chafe by the running-gear.

Scotch Mist. Very fine, drizzling rain.

Scotch Prize. A prize that is not legal; one that should not have been made, and must be given up.

Scott, Gustavus H., Rear-Admiral U.S.N. Born in Virginia, June 13, 1812. Appointed from Virginia, August 1, 1828; frigate "Guerriere," Pacific Squadron, 1829–31; schooner "Experiment," Chesapeake Bay, 1833.

Promoted to passed midshipman, June 14, 1834; sloop "Vandalia," West India Squadron, 1835–36; waiting orders, 1837; West India Squadron, 1839–40.

Commissioned as lieutenant, February 25, 1841; frigate "Columbus," Mediterranean Squadron, 1843–44; special duty, 1845; frigate "United States," Mediterranean Squadron, 1846–47; ordnance duty, 1848–49; waiting orders, 1850; ordnance duty, 1851; frigate "St. Lawrence," Pacific Squadron, 1852–53; steamer "Michigan," on the lakes, 1855–57.

Commissioned as commander, December 27, 1856; light-house inspector, 1858–60; commanding steamer "Keystone State," special service, 1861; commanding steam-gunboat "Maratanza," North Atlantic Blockading Squadron, 1862–63.

Commissioned as captain, November 4, 1863; commanding steamer "De Soto," Blockading Squadron, 1864; commanding steam-sloop "Canandaigua," Blockading Squadron, 1865; commanding steam-sloop "Saranac," Pacific Squadron, 1866–67; member of Examining Board, Philadelphia, 1868; light-house inspector, 1869–71.

Commissioned as commodore, 1869.

Commissioned as rear-admiral, February, 1873; commanding North Atlantic Station, 1873. Retired June 13, 1874.

Scour. *To scour a beach*, to sweep it by a quick flanking fire. *To scour the seas*, to cruise piratically; to infest the seas.

Scouse. A sea-dish made of soaked and pounded biscuit and meat cut into small pieces. Where no meat is used, it is called *bread-scouse*. Where other ingredients are introduced, it is called *lob-scouse*.

Scow. A large, open, flat-bottomed boat.

Scrabble (*Eng.*). A badly-written log.

Scraler. The puffinet (*Colymbus grille*).

Scrape. The upper spars and the yard-arms of a man-of-war are kept bright, and it is customary to scrape them at least once in 3 months, or oftener. After they are scraped with knives, they are covered with *slush*.

Scraper. A triangular iron instrument with sharp edges, used in scraping parts of a ship. Scrapers are sometimes square, when they are called *tree-scrapers*, and sometimes have one point cut off, as in *deck-scrapers*. Also, a name for a cocked hat.

Scratch-race. An impromptu race, where crews volunteer or are drawn by lot.

Scrawl. The young of the *dog-crab*.

Scray. The sea-swallow, or tern (*Sterna hirundo*).

Screen. A canvas partition used about decks for various purposes. Coal-screens are used while coaling ship, to prevent the dust from

coming into the officers' quarters. Screens are used to form a room on the gun-deck for a court-martial, for school, or to separate a sick man from the crew. *Fire-* or *magazine-screens* are made of thick fearnaught.

Screw. A convex or concave cylinder with one or more helical projections, called *threads*, winding round it. The advance made in direction of the axis of the cylinder by one convolution of the thread is called the *pitch*. Convex and concave screws are designated technically by the respective names of *male* and *female*; a short concave screw fitted to a convex screw is called a *nut*, and when a screw is spoken of without qualification, a *convex* screw is usually understood. Screws intended to penetrate wood are usually pointed at the entering end.

A *compressor-screw* is used on a slide gun-carriage to increase the friction and decrease the recoil; an *elevating screw*, to depress or elevate the breech of the gun; a *thumb-screw*, to hold the sight in place. A *jack-screw* is a portable machine for raising heavy weight, acting by a screw. *Rigger's screws* are iron frames in which a screw works, moving a clamp, so that the parts of the rigging may be brought together as in a vise. A *rigging-screw* is an iron frame with a screw working in it, to the upper end of which a shroud is attached, while the frame is made fast to the channels. See SCREW-PROPELLER.

SCREW-BOLT. A bolt whose lower end is terminated by a screw. A *screw eye-bolt* is a screw terminated by an eye-bolt. A *screw ring-bolt* is a screw with a ring attached to its head.

SCREW-BOX. The box in which the foot of an elevating screw works.

SCREW-CLAMP. An iron half-frame with a screw attached to its upper portion, so as to be used as a portable vise. Used by ship-carpenters to bring two pieces of timber together.

SCREW-DOCK. An apparatus used for raising small vessels out of the water for graving purposes. It consists of a platform which has blocks and shores upon it; this platform is raised or lowered as required by the use of iron screws of large diameter, the screws being attached to a stationary frame above, as well as to the platform to be raised. The vessel is first floated and secured upon the blocks, and then raised to the desired height.

SCREW-FID. A fid for a mast, having a screw attached, by which it is withdrawn.

SCREW-GAMMONING. A gammoning consisting of a plate or chain fastened by a screw.

SCREW-PILE. A pile sunk by a screw on its lower end.

SCREW-POST. The main stern-post in a screw-steamer, through which the screw-shaft passes.

SCREW-PROPELLER. A contrivance for propelling a vessel by the action of a screw in the water, which serves as a *nut*. It consists of two or more *blades* or *vanes*, each forming a portion or helicoidal sector of a screw-thread, attached to a hub or centre revolving in a plane perpendicular to the direction of the motion of the vessel. It is made of cast iron, steel, or composition, and the blades may be either cast upon or bolted to the hub.

There are numerous varieties, differing widely one from another in the number and contour of blades, area presented to the resistance of the water, and in nature of *pitch*, which may be uniform or increasing either in direction of the axis or from hub to periphery. In the *plain true screw* the generatrix is a straight line projecting radially from the axis in a plane perpendicular thereto, one directrix being the axis and the other a helical curve of uniform pitch; but the generatrix may be curved or inclined in any direction, the angular directrix of variable pitch, or there may be two angular directrices differing one from another in pitch; and by combining these various conditions, an infinite variety of warped surfaces may be formed.

No general theory of the screw-propeller has yet been established, and engineers construct it in accordance with their personal investigations and experience, many preferring the plain true screw. It may be observed, however, in the matter of general proportions, that the pitch should be such as to permit the highest practicable velocity of engine piston; the diameter such that the screw will be so thoroughly submerged as to avoid loss of power in throwing water off in spray; the contour of the blades so designed as to reduce to a minimum the vibrations caused when they pass the stern-post; and that in some very satisfactory screws the total area projected in direction of the axis is about four-tenths of that of a circle having the same diameter. Screws that produce good results at some rates of speed are found to be less efficient at others.

This instrument is believed by some to be an early invention of the Chinese. Many claims have been made to its invention in modern times. Mr. J. Stevens, of New York, seems to have made the first attempt to apply it to the propulsion of a vessel. In 1804 he propelled a boat by some form of a screw. In 1815 the English engineer Trevethick patented a worm or screw revolving in a cylinder at the sides or stern of a vessel. In 1816, Robert Kinder applied for a patent for a shaft and screw of nearly the form now in use. The French claim the invention, and only a few years ago they erected at Boulogne a monument to Frederic Sauvage as the inventor.

The first demonstration of its value on a proper scale was made in England during the year 1836, by Capt. John Ericsson, a Swedish engineer, and now a resident of New York. After an experiment with a model he applied the screw to a boat 45 feet in length, named the "Francis B. Ogden," and made successful runs on the river Thames. Experiments were made in the presence of the Lords of the Admiralty by towing their barge 10 miles an hour; yet this same board reported the screw-propeller unsuited for vessels of war. In 1826, Mr. Woodcroft patented a screw-propeller. In 1836 or 1837, Mr. T. P. Smith took out a patent for a screw made to revolve under water in a recess at the side of the vessel, and the following year exhibited it in a small vessel. Soon after this it was applied to a vessel of 237 tons, called the "Archimedes." This vessel was tested against the "Widgeon," the fastest paddle-wheeler plying between Dover and Calais, and thus established the screw as a successful instrument of propulsion in England.

The British Admiralty at length ordered a screw-vessel, named the "Rattler," to be built from the same model and dimensions as the pad-

dle-wheel vessel "Alecto," then building. This was 8 years after Ericsson demonstrated its practicability, and after he built the screw-vessel "Robert F. Stockton," 70 feet long by 10 feet wide, at Birkenhead.

The "Rattler" proved successful, and established the necessity of adopting the screw in the British navy. (The screw used on this vessel is now in the South Kensington Patent Museum.)

Previous to the construction of the "Rattler," Capt. Ericsson came by invitation of Commodore Stockton, U.S.N., to Philadelphia, and there built the first war screw-steamship (the "Princeton") that ever cruised at sea.

This ship was launched in 1842, cruised on the coast in 1845, burst her big wrought-iron gun on the Potomac in 1843, by which accident several members of President Tyler's Cabinet were killed. She served on the blockade of the coast of Mexico in 1846–47; crossed the Atlantic in the latter-named year in search of Mexican privateers; returned home in July, 1849, and was broken up.

SCREW-PROPELLER GOVERNOR. See GOVERNOR, or MARINE GOVERNOR.

SCREW-PROPELLER WELL. A vertical pit or opening at the stern and through the counter of a vessel, into which the propeller is hoisted when sail-power alone is used.

SCREW-SHAFT. An engine shaft turning a screw-propeller.

SCREW-STEAMER. A steamer propelled by a screw.

Scrimp. Scant,—applied to the wind.

Scroll-head. A piece of timber joined to the knee of the head under the bowsprit, in place of a figure-head, which turns outward.

Scrovies. Old or worthless seamen sent on board by *crimps*.

Scrub. To scour the decks, hammocks, etc., with sand or soap. Decks are scrubbed with water only, with sand and broom, or are *holystoned* with sand.

SCRUB-BROOM. A coarse broom for scrubbing, made out of hickory strips, or coir.

SCRUB-BRUSH. A brush for scrubbing, made out of coir, or hog's bristles.

Scruff. The fur adhering to the bottoms of foul vessels.

Scud. Loose, vapory clouds, driven rapidly by the wind. *To scud*, to run before a gale with sufficient low canvas to keep the ship ahead of the sea. When a ship carries no sail, she *scuds under bare poles*. *To scud like a 'Mudian* (*Eng.*). to be off quickly.

Scull. An oar so short that one man may use a pair readily. A short oar used over the stern in propelling a boat. *To scull*, to row a boat with a pair of sculls, or to propel her by an oar over the stern, worked from side to side, and turned in the water, like a screw. Japanese boats are propelled very rapidly by means of sculls.

Sculpin. A fish of the genus *Cottin*. A fish, the *Callonymus dracunculus*.

Sculptor. See CONSTELLATION.

Sculptures. The carved decorations of the bow and stern of an old ship of war.

Scum. Refuse at change of tide. Fresh water running through salt, carrying physalia and other gelatinous animals with it in a line of foam. Thin atmospheric vapor; scud.

Scupper. A hole cut through the water-ways and the side of the ship, to carry off the water from the decks. Also called *scupper-hole*.

SCUPPER-HOSE. A canvas or leather pipe nailed over the lower end of the scupper-holes, to keep the water from staining the ship's side.

SCUPPER-LEATHER. A leather valve, nailed over a scupper-hole, so as to allow no water to enter from outside.

SCUPPER-PLUG. A wooden plug, cut to fit the scupper-hole, so as to close it when desired.

SCUPPER-SHOOTS. Tubes of metal covered with wood, to carry the water from the spar-deck to the sea.

Scurry. A sudden fright, as of birds or fish.

Scurvy. *Definition.*—A special disease of malnutrition, affecting mainly the constitution of the blood, and dependent upon deprivation of vegetable food, attended by hemorrhages, livid spots under the skin, swollen, spongy, and inflamed gums, and general debility, not necessarily accompanied by fever.

History.—Hippocrates gives a description of symptoms closely corresponding to what we now recognize as scurvy.

Celsus (lib. ii. c. vii.) speaks of the ulcerations attending scurvy in a graphic manner.

Aretæus, Paul of Ægina, and Avicenna, have noted the same chain of symptoms. Strabo and Pliny are supposed to allude to scurvy in the Roman army, and its cure by a certain herb, called *Herba Brittanica*.

The Sieur de Joinville gives a particular account of the ravages of scurvy in the French army under Louis IX. during the crusade against the Saracens of Egypt.

But the most terrible records of scorbutus are found in naval annals. More lives were sacrificed in former times by this disease than by all other causes combined, whether sickness, tempest, or battle (Wood).

Inefficiency and neglect in the allied armies' commissariat during the Crimean war caused severe suffering from scurvy; but during the late civil war in America it was not a source of any considerable mortality.

Nevertheless, some U. S. army hospitals recorded large numbers of cases where the scorbutic taint was the cause of serious and protracted disease, which was cured by its removal.

Symptoms.—Unwillingness and disability for bodily exertion, pallor, puffiness of face and limbs, livid and swollen gums, hard and painful swellings of the muscles, hemorrhages from mucous surfaces, bruised discolorations of the skin, excessive debility, and (often) extremely unhealthy ulcerations characterize the disease.

Causes.—The one essential cause of scurvy is the absence of sufficient vegetable food. It is not due—as formerly supposed—to living upon salt meat, but only to living upon it exclusively. It will not occur when vegetables are freely used, and it may break out when they are deficient, though an abundance of fresh meat be supplied.

Predisposing and assisting causes may be enumerated; *e.g.*, previous disease, unwholesome diet, bad water, foul air, or, in fact, whatever weakens the system, or tends to deprave the blood.

Treatment.—This consists in supplying the necessary food whose absence caused the disease. A sufficiency of fresh vegetables and fruits will

cause rapid and almost immediate cure of even the most desperate cases.

Most acidulous fruits, especially limes, lemons, oranges, and others of the family of *Aurantiaceæ*, are efficient remedies. To Dr. G. Perin, U.S.A., we owe the knowledge of the superior curative virtues of the juice of the *Agave Americana*, in doses of two or three fluidounces three times a day. Potatoes, cabbage, turnips, carrots, water-cresses, onions, and radishes are among the most desirable vegetables for use in this disease.

Cider, malt liquors, and wines should be allowed.

Prevention.—Absolute certainty attends preventive measures against scurvy. It is only necessary in sea-voyages to attend to cleanliness and ventilation of vessels, the general comfort of the crews, and the supply of sufficient lime-juice to distribute an ounce per diem to each man on board ship.

In armies and hospitals, the only requisite is a varied vegetable diet.

Practically, scurvy is no longer a scourge by sea or land, and can become so only by inexcusable neglect.—*John T. Carpenter, President Pennsylvania State Medical Association.*

SCURVY-GRASS. The spoon-wort, a grass of the genus *Cochlearia*, formerly eaten as a salad, to cure scurvy, or prevent it.

Scutch. To separate the fibre of hemp from the woody part by beating.

SCUTCHER. A wooden sword for breaking hemp.

Scuttle. A small opening in the deck of a vessel not over two feet square; they are generally made flush with the decks, without coamings. *To scuttle a ship*, to sink her by boring holes in her bottom.

SCUTTLE-BUTT. A cask, having a square hole cut in its bilge or head, with drinking-water in it for the men's use.

Scuttle-fish. The cuttle-fish (which see).

Sea. The swell or billowy motion of the ocean; a high wave or billow. *At sea*, away from the land; on the ocean. Figuratively, bewildered, confused. *To ship a sea*, to receive a portion of a wave over the rail of a vessel. *Half-seas o'er*, half-drunk, tipsy. *High seas*, the open sea; where the tide ebbs and flows. *Full sea*, high-tide. See CHOPPING, COCKLING, CROSS, GREEN, etc.

A sea is a body of salt water, only less in size than an ocean. The same word is used to designate lakes, as the Dead Sea and Sea of Aral, and likewise expresses the idea conveyed by the word ocean, meaning the whole mass of water. The movement of the water in waves and surges is called by the sailor a sea, the figure of speech being exactly opposite to that in the last case. Seas are only inferior to oceans in size, although there are some small seas, such as Marmora and Azof, neither exceeding 5000 square miles in extent. The seas emptying their waters into the Arctic are the White Sea, having an area of 10,000 square miles, the Kara Sea, containing 100,000 square miles, and Greenland Sea, about the same area. These seas, frozen during much of the year, are little navigated. Into the Pacific empty the following Asiatic seas: 1. Behring's Sea, containing some 145,000 square miles, washing also the coast of Alaska and the chain of Aleutian Islands. It is important for its fisheries, the seal and whale abounding. 2. Kamchatka Sea, an arm of the latter, containing some 58,000 square miles, and washing the shores of Kamchatka. Several bays open on it, and the important port of Petropaulowski is situated on one of them. 3. Sea of Okhotsk. The Kamchatka peninsula and the Kurile Islands separate this large sea, containing 180,000 square miles, from the Pacific. Many bays open into it, and Saghalien Island is situated in it. 4. The Sea of Japan, connected with the latter by two straits, and separated from the Pacific by the Japan Islands, contains 150,000 square miles. The Corea Channel connects it with (5) the Yellow Sea, opening into (6) the Eastern Sea. Both these seas wash the shores of China, and receive the waters of the mighty Hoang-Ho and Yangtze-Kiang. The former has 130,000, the latter 115,000 square miles of area. Their navigation is most important. The former gets its name from the mud brought down by the rivers, and a like cause shallows them to some extent near the coast. 7. The China Sea. This immense sea, containing 420,000 square miles, washes the shores of China, Anam, Malay peninsula, Philippine Islands, and Borneo. It connects by channels and straits with the Eastern Sea, Bengal Sea, Indian Ocean, Pacific Ocean, and the three following seas. Many important ports, as Singapore, Bangkok, Hong-Kong, Canton, Manila, and others, are situated on or near it, and its navigation is very important, and commerce extensive. Many shoals and islands exist in it. It is the fourth in size of the great seas. 8. Mindon Sea, 142,000 square miles. 9. Celebes Sea, 216,000; 10. Java Sea, 173,000; 11. Floris Sea, 72,000; 12. Banda Sea, 75,000; 13. Arafura Sea, 172,000 square miles. All these are situated in the Malaysian Islands, connecting with each other, and with the Pacific and Indian Oceans. They are the channels of communication in this island world, and are much encumbered by small islands.

The seas emptying into the Indian Ocean are, 1. Bengal Sea. This, with the gulf of the same name, lies between the Eastern provinces and the Western Indian peninsula. It contains 360,000 square miles, and is next in size to the China Sea. 2. Arabian Sea. This sea, containing 560,000 square miles, washes the shores of Arabia, Beloochistan, and India. Into it empty the Persian Gulf and the Red Sea, and the waters of the Indus, Euphrates, and Tigris find their way through it to the Indian Ocean. It was the scene of an ancient commerce, and the trade of India and China is again brought through it by the opening of the Suez Canal. 3. Red Sea. This is a long, narrow sea, between the sandy regions of Arabia and Egypt, and is hot, very salt, and difficult of navigation. But the commerce of the East finds its way through it, and its navigation is most important. The northern end is at a lower level than the southern, and its waters find their way into the Arabian Sea by the Straits of Bab-el-Mandeb and the Gulf of Aden. It connects with the Mediterranean by the Suez Canal. No seas open into the Pacific from the west coast of America. On its eastern shores is but one, the Caribbean Sea, the largest in the world, containing 705,000 square miles. It washes the shores of South America, Central America, and the West India Islands, which

latter separate it from the Atlantic. It connects with the Gulf of Mexico by Yucatan Channel, and contains Jamaica and many smaller islands. Its navigation, rendered more important by a railroad, will be far more increased by the completion of a projected canal, but its many islands and shoals, and its numerous storms and calms, are serious impediments.

The seas opening into the Atlantic from the shores of Europe are many and important. To the north are the Irish Sea, measuring 8000 square miles; the North Sea, 172,000; and the Baltic, 155,000. The North Sea washes the coasts of the British Isles, Holland, Denmark, Belgium, and Norway, and through it passes the large and important commerce of the North. Into it opens the Zuyder Zee, a shallow sea in the north of Holland, and through it the Baltic empties its waters into the Atlantic by the Cattegat and Skager-Rack Sounds. The Baltic, with its arms, the Gulfs of Bothnia and Finland, penetrates far into the European continent, washing the coasts of Germany, Sweden, and Russia. Its entrance is exceedingly difficult, and it contains many large islands and innumerable small ones near the coast, making its navigation difficult. Its shores are everywhere flat, and many gulfs and 240 rivers—many of them large—empty into it. Its water is very fresh, and it is quite shallow in places.

The Mediterranean, with its chain of seas, is the only other sea opening into the Atlantic. It is only inferior to the Caribbean in size, having an area of 690,000 square miles. It lies between Europe, Asia, and Africa, and has for centuries been the scene of the most important commerce. Into it open the following seas: 1. Tyrrhenian; 2. Ionian,—each containing 18,000 square miles; 3. Adriatic, 40,000; 4. Ægean, 40,000; 5. Marmora Sea, 4000; 6. Black Sea, 160,000; 7. Sea of Azof, 10,000. Many important cities are on its shores, numerous large rivers flow into it, and several islands lie in it. The only remaining sea is the Caspian, containing 120,000 square miles, an inland sea, shallow on the shores, deep in the centre, containing no currents nor tides. It receives the waters of the Ural, Volga, and other rivers, and is subject to singular variations in size during long periods of time. It is no longer doubted that it was one with the Sea of Aral, and many geographers maintain that it was connected with the Mediterranean by way of the Sea of Azof. Its winds are variable and its storms terrific. Small vessels only navigate its waters, none larger than 150 tons. It is 330 feet below the level of the sea, and 100 feet below the Aral Sea. Properly speaking, it is a lake, but its great size leads it to rank with seas, while the name of sea for the Aral and Dead Seas is considered a misnomer. The Caspian Sea is less salt than the ocean, the fresh water brought in by its many rivers more than compensating for the very rapid evaporation. With the exception of Russia, the countries bordering on it are uncivilized, and no great cities are placed on it, and its commerce is small and less important for this reason.—*F. S. Bassett*, *Lieutenant U.S.N.*

Sea-adder. A British fish, of an elongated and slender form, with 15 short dorsal spines, and the entire lateral line covered with carinated scales; the *Gasterosteus spinachea*, or stickleback. The pipe-fish, *Syngnathus*.

Sea-anchor. The anchor lying toward the sea. A floating anchor used at sea in a gale. It is easily improvised by making a triangle of small booms, passing a sail between them, backing or thrumming it with rope, and fastening the cable to a bridle extending from the three apexes of the triangle. A more portable frame is made of two iron bars, joined at their centres so as to make the letter X, which may be shut up when not in use.

Sea-anemone. The *Actinia*, a polyp resembling a flower.

Sea-ape. The sea-fox. The otter.

Sea-attorney. The brown shark.

Sea-bank. A bank or mole to keep the sea from encroaching on the shore.

Sea-bar. The sea-swallow.

Sea-barrow. See Sea-pincushion.

Sea-bat. A kind of flying-fish.

Sea-beans. Acacia-pods, brought down by rivers, and found on beaches in southern waters.

Sea-bear. The polar bear. Seals of certain genera, as *Arctocephalus* and *Otaria*, using their hind fins in walking. See Seal.

Sea-beard. *Cladaphora rupestris*, a sea-weed growing in dense tufts.

Sea-blubber. A marine insect.

Sea-board. Land bordering on the sea; the sea-shore.

Sea-boat. A boat, considered with reference to her qualities or behavior at sea; as, a good, or a bad sea-boat.

Sea-borne. Afloat on the seas; water-borne.

Sea-bottle. The seed-pod of the *Fucus gigantea*, found in Horn latitudes.

Sea-bream. A sea-fish of the genus *Pagellus* (*Sparus* of Linnæus), growing to the length of from 16 to 20 inches, and used for food.

Sea-breeze. A breeze setting from the sea toward the land. See Breeze.

Sea-brief. See Sea-letter.

Sea-calf. The common seal, *Phoca*.

Sea-cap. White-caps, or wind-blown wave-summits.

Sea-card. An old name for a chart. The mariner's compass.

Sea-carp. A spotted marine fish, living among rocks and stones.

Sea-cat. The wolf-fish, *Ananhicas lupus*. A fish of the family *Chimœroidei*, intermediate between the sturgeon and the shark. The northern sea-cat (*C. monstrosa*) inhabits northern waters, and has green pupils, which shine at night like a cat's eyes. The southern sea-cat (*C. Australii*) has a snout turning back like a hoe, and is of a silvery color.

Sea-catgut. The sea-weed *Fucus filum*, or sea-thread.

Sea-chickweed. A marine plant, *Honkenya peploides*, growing in tufts in the sand.

Sea-coast. The shore or land washed by the sea.

Sea-cob. The sea-gull.

Sea-cocoanut. Cocoanuts from the palm, *Lodoicea seychellarum*, found in the Leychelle Islands. First found floating in the sea, they were thought to be fruit of the sea-weed.

Sea-compass. The mariner's compass.

Sea-coot. The coot (*Fulica*).

Sea-cormorant. The *sea-crow*.

Sea-coueter. The arctic puffin, *Fratercula arctica*.

SEA-COW. The manatee (which see).

SEA-CROW. The pewit gull, or *Xema ridifundus*. The cormorant.

SEA CROW-FISH. Crustacea of the genus *Palnurus*.

SEA-CUCKOO. The red gurnard, or *Trigla cuculus*.

SEA-CUCUMBER. The *bèche-de-mèr*, an echinoderm of the genus *Holothuria*. Salted and dried, it is eaten in China under the name of *trepang*. They are found in shallow water, and there are 8 genera, with 13 species on the American coast.

SEA-CUNNY. The helmsman in Lascar-manned East India vessels.

SEA-DAFFODIL. A bulbous plant, the *Pancratium maritimum*.

SEA-DEVIL. A fish of the ray family (*Cephaloptera*). The angler, or *Lophius piscatorius*.

SEA-DOG. The common seal. *An old salt;* a sailor long used to the sea.

SEA-DOTTEREL. The *Strepsilus interpres*, a sea-bird belonging to the plover family.

SEA-DRAGON. A marine fish of the genus *Cottus*.

SEA-DRAKE. See SEA-CROW.

SEA-EAGLE. The bald eagle. A large ray, with wing-like fins and a long tail, armed with a bone barb. It belongs to the genus *Myliobatis*.

SEA-EAR. A gasteropod mollusk of the genus *Haliotis*, green and violet inside, and resembling the human ear in shape.

SEA-EDGE. The bounding-line between the frozen and unfrozen regions of the pole.

SEA-EEL. The conger-eel.

SEA-EGG. The *Echinus*, or sea-urchin, after its spines are removed.

SEA-ELEPHANT. A large species of seal, the *Macrorhinus proboscideus*, growing to 30 feet in length, and having a fleshy snout about a foot long.

SEA-FARING. Following the sea as a means of livelihood.

SEA-FENNEL. The same as *samphire* (which see).

SEA-FERN. A kind of coral resembling a fern.

SEA-FIGHT. A naval action; an engagement at sea.

SEA-FISH. Salt-water fish. Any fish that lives usually in salt water.

SEA-FOWL. A marine fowl. A bird that lives by the sea and gets its food from salt water.

SEA-FOX. A species of shark, the upper lobe of whose tail is much longer than the lower, and curves upward. It frequently measures 13 feet in length, including the tail, which is then more than 6 feet long.

SEA-FROG. Same as *fishing-frog* (which see).

SEA-GAGE, or GAUGE. A form of sounding instrument, by which the depths are ascertained by the registered pressure of a liquid or vapor in the instrument.

SEA-GARLAND. A kind of marine plant.

SEA-GATE, or GAIT. A long, rolling swell. Ships that collide by its means are in a *sea-gate*.

SEA-GIRDLE. A marine plant, the *Laminaria digitata;* also called *sea-wand*, *sea-ware*, and *tangle*.

SEA-GODS. Deities supposed to have power over the sea. Principal among the Grecian deities were (1) Pontus, the father of sea-deities, and (2) Oceanus. The sons of Pontus were (*a*) Nereus, the god of the quiet sea; (*b*) Thaumas, god of the majesty of the sea; (*c*) Phorcys, (*d*) Ceto, (*e*) Eurybia, deities of the dangers and terrors of the sea. The sea-nymphs were the descendants of Oceanus. Aphrodite, born of the foam, was goddess of the sea, tutelary goddess of ships and mariners, and controlled the winds and waves, and gave good voyages. She was wife to Neptune, the principal god of the sea, who dwelt in ocean depths, and from thence controlled winds and waves. Sacrifices were made to him, especially by the Ionians in the temple at Corinth. One of his sons was Triton, and the Nereids, 50 daughters of Nereus, attend on him.

A favorite sea-deity was *Glaucus*, especially the god of fishermen and shipwrecked sailors.

SEA-GRAPE. The gulf-weed.

SEA-GRASS. An aquatic plant, the *Zostera marina*.

SEA-GREEN. A faint green. In ancient heraldry, the color denoted inconstancy.

SEA-GROCER (*Eng.*). An old name for the *purser*.

SEA-GULL. A sea-fowl, the *Xema ridibundus*. It is considered indicative of approaching bad weather for them to seek the shore in numbers, or to alight on ships at sea. To kill a gull is bad luck. Their stupidity is proverbial, and they are easily duped.

SEA-HARE. A marine gasteropod mollusk, the *Aplysia*.

SEA-HEATH. Evergreen plants of the genus *Frankenia*, found on sea-shores.

SEA-HEDGEHOG. The *Echinus*, or sea-urchin.

SEA-HEN. The guillemot, a sea-bird of the genus *Uria*. The crooner, a fish of the *Trigla lyra*.

SEA-HOG. The porpoise.

SEA-HOLLY. An evergreen plant of the genus *Eryngium*, found on the sea-shore.

SEA-HOLM. A small, uninhabited island.

SEA-HORSE. The walrus. The hippocampus, a fish having a prehensile tail.

SEA-KALE. An edible plant, the *Crambe maritima*, found on the sea-shore; sea-cabbage; sea-colewort.

SEA-LAKE. A lagoon.

SEA-LARK. A sand-piper. The ringed dotterel.

SEA-LAWS. See MARITIME LAW, OLERON CODE, RHODIAN LAWS.

SEA-LAWYER. An idle, querulous sailor, given more to questioning orders than to obeying them; one disposed much to argue the question. The tiger-shark.

SEA-LEGS. Ability to walk on the moving deck at sea. *To get sea-legs on*, to become accustomed to the motion, so as to walk on the deck.

SEA-LEMON. A marine gasteropod mollusk of the genus *Doris;* it is lemon-colored, oval, and marked with numerous punctures.

SEA-LEOPARD. A seal, the *Stenorhynchus leopardinus*, spotted like a leopard.

SEA-LETTER. A document issued by the civil authorities of the port in which a vessel is fitted out, and a certificate of the nationality of the vessel. It specifies the nature, quantity, ownership, and destination of the cargo.

SEA-LION. A large seal of the genus *Platyrhynchus*, having a mane like a lion. See SEAL.

SEA-LOG. That part of the log book relating to the ship while at sea.

SEA-LOUSE. A crab, the *Pediculus marinus*.

SEA-MAID. A mermaid or sea-nymph.

SEA-MALL. The mew; a sea-gull.

SEA-MARK. Any object, as a beacon, steeple, chimney, tree, or hill, easily distinguishable from to seaward, and used as a guide in the piloting of a vessel.

SEA-MEN. Same as SEA-MALL.

SEA-MOUSE. A marine annelid, the *Aphrodita aculeata*, covered with long iridescent hairs.

SEA-NAVEL. A small shell-fish.

SEA-NEEDLE. The sea-pike, or gar (*Belone vulgaris*), with long pointed jaws and a forked tail.

SEA-NETTLE. All *Acalephæ*, particularly the *Medusæ*, that have the property of stinging.

SEA-NYMPH. A nymph or inferior goddess of the sea.

SEA-ONION. A sea-coast plant, the *Scilla maritima*.

SEA-OOZE. Soft mud near the shore.

SEA-ORB. A round marine fish.

SEA-OTTER. An aquatic mammal, the *Enhydra marina*, found in the North Pacific Ocean.

SEA-OWL. The lump-fish.

SEA-PAD. The star-fish.

SEA-PANTHER. A fish like a lamprey.

SEA-PASS. See PASSPORT.

SEA-PAY. The pay received or due for actual service in a sea-going ship.

SEA-PERCH. Salt-water perch.

SEA-PHEASANT. The pin-tail duck, *Dafila caudacuta*.

SEA-PIE. A sea-fowl, the *Hæmatopus ostralegus*, also called the oyster-catcher, from its thrusting its bill into open oysters and eating them. A dish composed of fish or meat and vegetables in layers between crusts, the number of which decide whether it is a *double-decker* or a *three-decker*.

SEA-PIKE. The gar-fish.

SEA-PINCUSHION. A star-fish, of the genus *Goniaster*.

SEA-PINK. A marine plant, the *Cerastium repens*.

SEA-POACHER. The pogge, or *Catophroctus Schonœldii*.

SEA-PORCUPINE. This name is given to several fish of the genera *Diodon* and *Tetraodon*, whose bodies are thickly covered with spines. Their flesh is poisonous, and one species gives electric shocks if touched.

SEA-PORK. The flesh of young whales.

SEAPORT. A haven on the sea.

SEA-PUDDING. A species of holothurian.

SEA-PURSE. See MERMAID'S PURSE.

SEA-PURSLANE. A marine plant of the genus *Sesurium*.

SEA-QUADRANT. A name for the *Jacob's staff*.

SEA-QUAKE. A quaking or shaking of the sea.

SEA-RATE. See CHRONOMETER.

SEA-RAVEN. The *sculpin*, a fish of the genus *Hemitripterus*.

SEA-REACH. The straight lower course of a winding river emptying into the sea.

SEA-REED. A grass (*Calamagrostis arenaria*) found on the sea-shore.

SEA-RISK. Hazard or risk incurred by passage at sea.

SEA-ROBIN. The gurnard, a fish of the genus *Trigla*.

SEA-ROCKET. A plant of the genus *Cakile*, growing on the shore.

SEA-ROKE. A cold fog or mist, spreading from the sea inland.

SEA-ROOM. Ample space at sea to drive or scud without danger.

SEA-ROVER. A sea-robber; a pirate.

SEA-SCORPION. A voracious marine fish, the *Cottus scorpius*, having its head armed with spines.

SEA-SERGEANTS. A Welsh secret society, existing from 1726 to 1765.

SEA-SERPENT. A fabulous animal continually rediscovered at sea. A Mediterranean eel. A large Australian marine serpent, the *Hydrus Stokesii*. The stories of the sea-serpent were mythological in origin, coming from the north of Europe, but many scientists have acknowledged the possibility of the existence of *Saurians*, or sea-reptiles of great size.

SEA-SHORE. The coast of the sea. In law, the land between low- and high-water marks.

SEA-SICKNESS. Vomiting caused by the motion of a vessel or boat. The premonitory symptoms are vertigo and headache, with a peculiar feeling of sinking and distress about the pit of the stomach, which is soon followed by a profound nausea accompanied with convulsive heaving of the stomach and utter prostration of the entire body; a deadly pallor and profuse cold sweat are commonly present.

SEA-SLATER. The *Ligia oceanica*, a small shell-fish.

SEA-SLEEVE. The squid, *Loligo vulgaris*.

SEA-SLUG. The sea-cucumber, or *Holothuria*.

SEA-SNAIL. A fish found under stones near the sea-shore, belonging to the genus *Liparis*.

SEA-SPIDER. A crab with a triangular body and long, slender legs, the *Maia squinada*.

SEA-SPOUT. The spouting of water through a cleft in a rocky cliff.

SEA-STAR. The star-fish.

SEA-STREAM. A polar term, indicating a collection of bay-ice, affording shelter behind it from the ocean.

SEA-SWABBER. A term of reproach for an idle sailor.

SEA-SWALLOW. The tern, *Sterna hirundo*. The storm-petrel, *Procellaria pelagica*.

SEA-SWINE. Porpoises.

SEA-TANG. Tang, or sea-weed.

SEA-TOAD. An ugly sea-fish.

SEA-TRANSOM. The stern-transom bolted to the ends of the counter-timbers.

SEA-TURN. A breeze, gale, or mist from the sea. A tack to seaward.

SEA-UNICORN. The narwhal. See NARWHAL.

SEA-URCHIN. The *Echinus*. See SEA-EGG.

SEA-WALL. A wall built to prevent the sea from overflowing inclosed lands.

SEAWARD. Toward the sea.

SEA-WARE. Sea-weed thrown on the beach.

SEA-WATER. The water of the ocean varies greatly in its component parts in different localities. The solid parts contained therein are chlorides of sodium, potassium, and magnesium, bromide and sulphide of magnesium, carbonate of lime and magnesium, ammonia, silver, and traces of other metals. Water from the Mediterranean contains 410 parts in 10,000; from the English Channel, 380 parts; from the North Sea, 312 to 360 parts; and from the Baltic, 66

to 216 parts. The average of solid parts is 3½ per cent., and the average specific gravity is 1.0274. The water of the Dead Sea is really a mineral water, being 25 per cent. of solid parts.

SEA-WEASEL. The *lamprey eel.*

SEA-WEED. See ALGÆ.

SEA-WIFE. A fish of the genus *Labrus.*

SEA-WILLOW. A polyp belonging to the genus *Gorgonia.*

SEA-WOLF. The wolf-fish. *Anarrhicas lupus*, found in northern seas about Greenland, Iceland, Norway, Scotland, England, etc., and so named from its fierceness and ravenousness. It grows sometimes to the length of 4, and even 7 feet, and feeds on crustaceous animals and shell fish, as well as on common fish. A kind of seal. See SEAL.

SEAWORTHY. Fit in every way to make a voyage at sea. Staunch and tight.

SEA-WRACK. Sea-weed and grass thrown on shore on the coast of Holland, and used for manuring land (*Zostera marina*).

Seal. An aquatic carnivorous mammal of the family *Phocidæ.* They subsist on fish, and are abundant in the colder waters of the globe. The following are the most important genera and species: The genus *Callocephalus*, or *Phoca*, the common seal, *C. vitulinus*, belonging to it. It is common in European and American waters, and is valuable for its oil, furs, and skin. It is from 4 to 6 feet long. The *P. barbata*, or bearded seal, is found on icebergs in the open Polar Sea, and attains a length of from 10 to 12 feet. The Greenland seal, *P. Grœnlandica*, is found in herds on floating ice; is most useful to the Esquimaux for its oil, flesh, and skin, and fur; is but 6 feet long. The hare seal, *P. leporina*, is from 6 to 7 feet long, and is found about the northern shores of Europe. Another genus is *Halichœrus.* To it belong the *H. griseus*, or gray seal, and the *H. Caspica*, or Caspian seal, found in the Caspian Sea, and valuable for its excellent oil. To the genus *Stenorychus* belongs the *sea-leopard*, and to the genus *Pelagius*, the monk seal, or *P. monachus*, white-bellied, from 8 to 10 feet long, found in the Adriatic and Mediterranean Seas. To the genus *Stemmatopus* belongs the crested seal, *S. cristatus*, 7 to 8 feet long, which has a membranous sac on its head, capable of inflation. It is found on the coast of Labrador. The largest seal, the *elephant seal*, belongs to the genus *Macrorhinus* (*M. proboscideus*), and attains a length of 25 feet. Its oil is quite valuable. Many seals belong to the genus *Otaria*, also known as *Platyrhynchus* and *Arcto-cephalus.* The sea-lions and sea-bears belong to this genus. There is a northern sea-lion (*O. Stelleri*) and a southern sea-lion (*O. Jubata*), as well as a northern sea-bear (*O. Ursina*) and a southern sea-bear (*O. Irorsteri*), the latter nearly extinct.

Sealed Orders. Orders sealed, only to be opened at a certain time, for instance, after the ship is at sea, to prevent their being divulged.

Seam. The openings between the planks of the deck and sides of a ship, that are filled with oakum and pitch in calking. The junction of two pieces of canvas, when they are sewed together. Sails, awnings, etc., are sewed with different seams, varying with circumstances. A *flat seam* is one in which two edges of canvas are overlapped two inches, and then each edge is stitched to the other piece by a direct seam. When old canvas is restitched, it is sometimes necessary to *middle stitch* a flat seam, by running a seam midway between the other two. A *round seam* is one in which two edges of cloth are brought together, and stitched together by overcasting the thread. A *cord seam* is one in which the edges are again brought together, as in the round seam, but are slightly rolled in on the cloth, and stitched to it. From 3 to 4 stitches an inch are taken.

Seaman. A mariner; a sailor. Properly, one competent to perform all the duties of the profession, whether man or officer. The grade of seaman, or able seaman, recognized in all navies, comprises those who are practically conversant with all the duties of common seamanship; as, to reef, to hand, to steer, to heave the lead, to rig the spars, sails, etc. In the U. S. navy they are paid $21.50 per month; in the English navy, from $6 to $7. *Ordinary seamen* are those only partially skilled in these duties.

SEAMAN-GUNNER. Seamen who are particularly trained in gunnery duties, forming a distinct grade in many navies. The grade was created in the U. S. navy, but is fast becoming extinct.

SEAMAN'S DISGRACE. A foul anchor.

Seamanship. The practical science and art of rigging, fitting, manœuvring, and handling a ship or boat.

Searcher. A customs-officer. An instrument for examining the bore of guns.

Seasoned Timber. Timber prepared for use by preservation in air, water, or by chemical processes for a certain length of time.

Seasoning a Ship. Allowing a ship to stand before she receives her planking, so as to dry out the timbers.

Seat. In mechanism, an accurately fitted portion of a frame or relatively fixed piece on which another piece bears, rests, or is secured; as, the *seat* of a bracket or flange, or a *valve-seat.*

Seat-lockers. Lockers arranged so as to form seats in the cabins, etc.

Secondary Circles. Great circles of the sphere passing through the poles of another great circle, which is called their *primary.*

Secondary Meridians. Meridians of the earth which are determined like the *first*, *prime*, or *primary* meridians, such as those of Greenwich, Paris, etc., by astronomical or absolute evidence, independently of the chronometrical or relative method. The primary meridians are those from which the longitudes in the tables and on the charts are reckoned; the secondary meridians are useful as fundamental and independent starting-points in making passages.

Secondary Planet. See PLANET.

Second Captain. A commander in a ship under a captain, in some navies.

Second Differences. See DIFFERENCES, SECOND.

Second Futtocks. The timbers of the frame next above and joined to the first futtocks, or to the floor-timbers.

Second-hand. The second in charge of a fishing-boat.

Second Lieutenant. A term often employed to designate the officer next in rank to the executive-officer; the navigator. The lowest grade of commissioned officers in the marine corps, ranking with an ensign in the navy.

Second Officer. The second mate of a merchant vessel.

Second-rate. The second of the grades into which ships of war are divided. See CLASSIFICATION.

Secret Block. A block with a lignum-vitæ shell, open only at two orifices sufficiently large to allow the rope to pass through that is to work around the sheave.

Secretary. A rank in the navy corresponding with lieutenant, bestowed on the person employed as the private clerk or amanuensis of the admiral and of the vice-admiral. An officer detailed to serve as clerk to a flag-officer, usually ranking with lieutenant. The chief or confidential writer to the commandant of a naval station. See NAVY DEPARTMENT.

Sectional Dock. A form of floating dock, made in sections. Each section is a tank having trestle-work on the sides to which the shores are secured Outside the tanks on each side are floats made of sufficient capacity to impart the proper stability to the tank when the vessel is raised; on the top of the trestle-work is a walk or platform upon which the machinery used in pumping the dock is placed. It has an advantage over the docks for light and air, and can be used or floated anywhere where there is sufficient water.

The tanks and blocks of an ordinary sectional dock require fifteen feet more water than the ship which is intended to be raised. For this reason alone a basin dock is better for most purposes.

Secunda Giedi. The star α^2 *Capricorni.*

Secure! A command in exercising or working heavy guns, meaning to so arrange the breeching and tackles that the gun shall be in no danger of breaking loose in a sea-way. Guns are secured more thoroughly for sea than for port.

Securing-bolts. Eye-bolts placed in the ship's side, nearer to the port than the fighting-bolts, in which the outer blocks of the tackles are hooked when the gun is secured.

Sediment Collector. A perforated inverted cone, placed at the mean water-level of a marine steam-boiler, to the apex of which the surface blow-pipe is attached. It is not found efficient in practice.

A cylindrical drum, attached to the bottoms of Western-river steamboat boilers, to which the *mud blow-off pipe* is connected.

Sedow. The *gilt-head* (*Sparus auratus*).

Seeling. Sudden heeling over, and return to an upright position.

Segment-shell. A rifle-shell, having a thin outer shell lined with segmental pieces of cast iron, to separate at explosion.

Seize. To fasten ropes to each other or a rope to any object by regular turns of a small line.

SEIZINGS. These are of various kinds, according to their position and use. An *eye-* or *throat-seizing* is one or two parts of a rope that cross to form an eye. A *round seizing* has *riding* or *upper* turns over the first layer. A *flat seizing* has but one layer of turns.

SEIZING-STUFF. *Small-stuff* is used for seizings, *foxes* and *rope-yarns* for temporary seizings, *marline*, *hambroline*, *houseline*, *round line*, etc., for permanent seizings. Seizing-stuff is 9-, 6-, or 4-thread stuff, of tarred hemp yarns.

Selaciun. One of a tribe of cartilaginous fishes, including the ray and the shark.

Selchie. The seal, *Phoca vitulina.*

Self-fastening Rowlock. A metal rowlock, whose socket travels in a tube, so that it fastens itself in on reaching the bottom of the tube.

Self-mousing Hook. A hook closing automatically by means of a tongue, so that it will not slip.

Selfridge, Thomas O., Rear-Admiral U.S.N. Born in Massachusetts. Appointed from Massachusetts, January 1, 1818.

Commissioned as lieutenant, March 3, 1827; Exploring Expedition, 1829; sloop "Natchez," West India Squadron, 1830; frigate "Delaware," Mediterranean Squadron, 1834; frigate "North Carolina," 1837; rendezvous, Boston, 1840.

Commissioned as commander, April 11, 1844; navy-yard, Portsmouth, N. H., 1845; frigate "Columbus," East India Squadron, 1846; commanding sloop "Dale," Pacific Squadron, 1848; commanding rendezvous, Boston, 1851–52; Boston Navy-Yard, 1853–55.

Commissioned as captain, September 14, 1855; commanding steamer "Mississippi," 1861; commandant Mare Island Navy-Yard, Cal., 1862–64.

Commissioned as commodore, July 16, 1862. Retired October 10, 1866; commandant navy-yard, Philadelphia, 1867–68; president Examining Board, 1869.

Commissioned as rear-admiral, July, 1870.

Selvagee. A rough rope, made of a bundle of rope-yarns wound round or marled with another yarn.

SELVAGEE STRAP. A strap made of selvagee, used in securing the breeching of guns, etc.

Semaphore. An upright post with movable arms, for making signals.

Semidiameter. Half the angle subtended by the diameter of the visible disk of a heavenly body at the eye of the observer.

Semimenstrual Inequality. An inequality of the tide, which goes through its changes every half-month.

Send. To pitch violently into the trough of a sea. To 'scend.

Senior Officer. The commanding officer, or the most advanced line-officer in rank at any time or place.

Sennit. Flat cordage, formed by plaiting rope-yarns or thread together. They must be of an odd number, and hence the name, *seven-knit.* There are several kinds. *Common* or *flat sennit* is plain plaiting, five to seven strands being used. *French sennit* is similarly made, but more strands are used, and it is more open, forming a woven band of yarns. *Round sennit* is formed by plaiting even numbers of strands in twos around a small rope or *heart. Square sennit* is made of even-numbered strands without a heart. Sennit of grass was formerly woven into hats by sailors, but is so no longer.

Sensible Horizon. See HORIZON.

Sentry, or Sentinel. A marine or seaman placed on post charged to guard certain property, or carry out certain orders. On board ship, marine sentries are stationed at gangways, cabin doors, over prisoners and scuttle-butt, and on the forecastle and poop.

Serang. The boatswain of a Lascar crew.

Serpens (*Lat.* "The Serpent" of Ophiuchus). A constellation lying to the east of the line joining Arcturus and Antares.

Serpent-fish. A fish with a body of a ribbon-

like and compressed form, and a band of red running lengthwise, *Cepola rubescens*.

Serpentine. An old 24-pounder, 13 feet long, weighing 4300 pounds.

Serve. To perform duty on board ship or in government establishments, or under orders. To cover a rope closely with smaller stuff, so as to protect it from the weather. Rope is first *wormed*, then *parceled*, then *served*. *To serve the vent*, to clear with the priming-wire before loading.

SERVICE. The small-stuff wound around a rope to protect it from the weather.

SERVING-BOARD. A flat piece of hard wood, having a handle attached, used in serving small ropes.

SERVING-MALLET. A short mallet, with a groove on the under side, used in serving large ropes.

SERVING-STUFF. Spun-yarn is generally used, but hambroline, houseline, and round line are sometimes preferred.

Set. The direction in which a current flows. A suit, or complete number, as a set of signals. To observe and note the bearings of any object by the compass. *To set sail*, to put to sea. *To set a sail*, to spread it. *To set the chase*, to observe well the bearing of a vessel chased. *To set the course*, to prescribe the course to be steered. *To set the watch*, to call and formally report the night-watch at 8 P.M. *To set up rigging*, to take in the slack of the standing rigging, so as to give a better support to the masts. *Setting up a ship*, raising her from the keel-blocks by wedging.

Set-bolt. A bolt used as a punch or drift to force a bolt farther in than can be done by driving; it is also used to drive out bolts. A bolt to force planks together.

Set-screw. A screw binding or clamping an adjustable piece, when *set* or adjusted, in a desired position, to another relatively fixed piece, such as a shaft, bar, or portion of a frame; as, the *set-screw* of a *collar*, *eccentric*, *wheel*, *slide*, etc.

Sett. A power used by shipwrights; two ring-bolts with a staff, fastened by cleats and lashings.

Settee. A vessel used in the Mediterranean, with a very long and sharp prow, and with lateen-sails.

Setting-pole. An iron-shod pole, to move a boat with in shallow water.

Severalty. A law-term, indicating the reference of disagreements among part-owners of a ship, or her cargo, to the courts.

Sew. To cant or heel when left on the sand by the tide.

Sewant. The plaice.

Sewin. A salmon taken in Welsh waters.

Sextans. See CONSTELLATION.

Sextant. The sextant (Lat. *sextans*, the sixth part) is a portable instrument for measuring angles by reflection, and is very generally used by navigators and surveyors for measuring the altitudes of heavenly bodies, the angular distance between them, and, in place of a theodolite, the horizontal angular distance between terrestrial objects. The instrument was invented by Sir Isaac Newton, who, however, did not publish his invention, which was subsequently made independently by Mr. John Hadley, an Englishman, and by Mr. Thomas Godfrey, a Philadelphian. The principle governing the construction of the sextant is, that "the angle between the first and last directions of a ray of light which has suffered two reflections in one plane is equal to twice the inclination of the reflecting surfaces to each other."

The sextant, held in the hand and requiring no fixed support, is peculiarly adapted to use on shipboard. For measuring altitudes at sea the line of the apparent horizon is used, but on shore, where various objects hide the natural horizon, an artificial horizon is used, consisting usually of a flat dish of mercury with a glass cover. The image of an object seen by reflection from the surface of the mercury, appears as much below the horizon as it is really above it, so that the angle between the object itself and its reflected image is double its altitude above the horizon. Attempts have been made to invent a device which would take the place of the sea-horizon when it was hidden by fog or haze, but thus far without much success.

With ordinary sextants no angles greater than about 120° can be measured, but with the admirable prismatic sextant of Messrs. Pistor & Martins, angles up to 180° may be accurately measured. In this instrument the index-glass of the ordinary sextant is replaced by a rectangular prism, and rays from the object seen directly come to the telescope without passing through any medium, such as the unsilvered portion of the horizon-glass. As both the reflected and direct objects are much better defined than in the ordinary instruments, this sextant is peculiarly well adapted for determining latitude by altitudes of stars on shore with the artificial horizon.—*F. M. Green*, *Lieutenant-Commander U.S.N.*

SEXTANT, ADJUSTMENT OF. The index-glass must be perpendicular to the plane of the arc. The horizon-glass must be perpendicular to the plane of the arc. The necessary adjustments are made by screws at the back of the mirrors. The line of collimation of the telescope must be parallel with the plane of the arc. The adjustment is made by means of the screws on the collar of the telescope. When the index-glass and horizon-glass are parallel, the index should coincide with 0 on the arc. The sextant need not be adjusted on account of this error, if the proper allowance is made on each observation.

Shackle. An iron link, one end of which is closed by a movable bolt. *Screw-shackle*, a shackle in which the bolt is screwed into place.

SHACKLE-BOLT. The large iron bolt that closes a shackle when in place.

SHACKLE-BLOCK. A block with an iron strap terminated by a shackle and bolt.

SHACKLE-NET. A flue-net.

SHACKLE-PIN. The small pin that confines the shackle-bolt in place. Wooden pins are generally used.

SHACKLE-PUNCH. An iron punch for driving out shackle-bolts.

Shad. Fish of the genus *Alosa*.

Shades. Sets of colored glasses fitted to reflecting instruments to diminish the glare of bright objects.

Shaft. In machinery, a long cylindrical or prismatic piece, which revolves or oscillates about its axis on journals fitted to suitable bearings, for transmitting to a wheel, lever, or other piece a rotative, oscillating, or reciprocating rectilinear

motion at any part of its length. Small and rapidly revolving shafts are called *spindles.*

A *counter-shaft* is a short shaft through which motion is transmitted by belts from line shafting, or the shaft of a prime mover to a working machine or tool, such as a lathe, planing-machine, saw, blower, etc. It is provided with a fixed and a loose pulley, and means for shifting the belt of the driving-pulley from one to the other, so that it may be set in motion or at rest at will, and with a pulley, drum, or speed-cone belted to corresponding parts of the driven machine. When it is required to suddenly reverse the motion, as with a screw-cutting lathe, two loose pulleys, driven in opposite directions by a pair of belts, one of which is crossed, are used; the motion being communicated to the shaft by a *sleeve* and *clutch.* The speed of the machine is determined by the relative sizes of the pulleys; and a *speed-cone* is used when varieties of speed are required.

An *intermediate shaft* is used for transmitting motion from one shaft to another when their relative positions will not admit of direct connection, or when the difference in speed is such as to require inconvenient sizes of wheels or pulleys; also, for preserving motion in the same direction of two shafts connected by toothed wheels or gearing.

Line shafting is a long, continuous line of sections of shafting held together by couplings; as, a *screw-propeller shaft*, or the *line shafting* of a factory.

SHAFT-ALLEY. A passage extending from the engine-room to the stern stuffing-box, in which is contained the propeller-shaft and its bearings.

SHAFT-BEARING. A support for the journal of a shaft. See BEARING.

SHAFT-COUPLING. A piece, or pair of pieces, for securing sections of shafting together. See COUPLING.

SHAFT-PIPE. The pipe, of copper or iron, placed in the dead-wood of a screw-ship as a lining; having glands or a proper packing at each end, it can be made water-tight.

Shag. The green cormorant, *Phalocrocorax graculus.*

Shake. *To shake out a reef*, to let it out and enlarge the sail. *To shake a cask*, to take it to pieces and pack the staves. These are called shakes, and hence the term "*no great shakes.*" *To shake the sails*, to luff up in the wind, causing the sails to shiver. A *shake* among shipwrights is a crack or rent in timber. *Shake a leg!* hurry up! be quick!

Shakings. Refuse of cordage, canvas, etc. Oakum swept up off decks.

Shallop, or Shalloop. A small boat rowed by two men. A light fishing-boat, with small fore- and main-lug sails. The term is also applied to *sloops.*

Shallows. Large extents of shoal water.

Shallow-waisted. A term opposed to *deep-waisted*, applied to flush-deck vessels.

Shan. Knotty or fibrous defects in timber.

Shang-Hai, the chief emporium of China, now open for European commerce, is situated in the province of Kiang-Soo, on the Woosung River, and 12 miles above the mouth of the Woosung, in the estuary of the Yang-tse-Kiang. The river, though three-quarters of a mile broad opposite Shang-Hai, is little better than a mere tidal channel. It is an important entrepôt of the commerce between the north and south provinces of China, exporting manufactured goods to Tien-Tsin, and importing large quantities of pulse, flour, meats, rhubarb, and skins from the shores of the Yellow Sea. It has an extensive river trade with the interior of China, and its coasting trade is also very large. It has regular steam communication with all the open ports of China and Japan, and with India, the United States, and Europe. About 2000 vessels clear port here annually, and the value of the imports and exports is about $75,000,000 each year. Lat. 31° 12′ N.; lon. 121° 28′ E. Pop. 250,000.

Shank. An arrangement of deep-sea fishing-lines. The main piece of an anchor, connecting the stock and the arms.

SHANK-PAINTER. A rope or chain which confines the shank of the anchor to the bill-board.

Shanny. A small fish (*Pholis subfurcatus*), which lurks under stones and weeds.

Shape. *To shape the course*, to determine the course which the ship is to steer.

Shark. Cartilaginous fish of the family *Squalidæ.* They are carnivorous and very voracious. There are some 100 species, varying greatly in size, from 3 feet to 40 feet in length. The *Scyllidæ* contains the *dog-fishes*, and they all spout. The white shark (*Carcharias vulgaris*) and the blue shark (*C. glaucus*) belong to this family. The basking-shark is the largest, and belongs to the genus *Selache.* It attains a length of 40 feet. The thresher-shark belongs to the genus *Alopia;* the *angel-fish*, *monk-fish*, or *fiddle-fish*, to the *Squalidæ.* The *hammer-headed* shark belongs to the *Zygænidæ.*

Sharks vary somewhat in their habits, many kinds being dangerous to man, while others are comparatively harmless. The name *shark* is also applied to crimps, sharpers, and low attorneys.

SHARK'S-MOUTH. The opening for the breeching at the cascabel of a gun. The irregular opening cut in an awning to embrace the mast.

Sharp. Prompt and ready. *Be sharp!* make haste! *Look sharp!* be quick! A sharp is one versed in some specialty, as a torpedo-sharp, a gunnery-sharp, etc. A yard is *sharp-up* when it can be braced up no farther. *Sharp-bottom*, a sharp floor, or one with considerable rise in the timbers. *Sharp-iron*, a calking-tool.

Sharpie. A long, flat-bottomed sail-boat, used in the United States.

Shear. An iron eel-spear. A stress tending to separate a body into parts, overcoming the cohesion of its particles by sliding one part over another in a plane parallel to the direction of the force.

Shear-bill. A sea-fowl, the *Rhynchops nigra.* The cutwater, or black skimmer.

Shear-hooks. A kind of sickle, formerly placed at the yard-arms to cut the rigging of an enemy on boarding her. They are described by Vegetius in his "Re militaris," and were extensively used in the 14th, 15th, and 16th centuries, and even as late as the 17th century they were seen.

Shears. See SHEERS.

Shear-water, or Shear-water Petrel. A sea-fowl, the *Puffinus Anglorum.*

Sheat-fish. See SHEET-FISH.

Sheathing. The casing or covering placed on a ship's bottom for protection. The material for

such covering. Ships were formerly *breamed*, or charred, for this purpose, but this afforded slight protection. Wood sheathing was also used. Lead was introduced in 1620, the sheets being fastened by copper nails. This lasted until 1770, the "Marlborough," English line-of-battle ship, wearing hers entirely off. With wood sheathing nails were sometimes used with heads so large as to meet and cover the sheathing. A coating of tar, pitch, and brimstone was used in 1737, and was quite successful. A Japanese junk of 800 tons was seen in Japan, in 1613, iron-sheathed. In 1761, copper was first applied as sheathing. Galvanic action was the greatest obstacle, and it led to the use of copper bolts. Compounds of copper with other metals have been used, chief among which are the following: Muntz's metal—copper, 60, zinc, 1 part; Mushet's metal—copper, 100, zinc, ½; Revere metal—copper, 95, zinc, 5; Wethersted metal—copper, 90 to 97, antimony, 3 to 10; Collins's red—copper, 8, zinc, 1; Collins's yellow—copper, 10, zinc, 8; Collins's white—copper, 1, zinc, 16, tin, 16; Pope's metal—lead, 1, zinc, 3, tin, 2 parts. Copper is put on with after and under sides lapping, and the sheets are of various sizes, shown by the weight in ounces to the square foot, being 16, 18, 28, and 32 ounces.

SHEATHING-NAILS. Large flat-headed metal nails, used to nail on sheathing. They are from ¾ to 2½ inches long, and have large flat heads.

SHEATHING-PAPER. Thick, coarse paper put on under the sheathing.

Sheave. The wheel on which the rope works in a block, or in a mast or yard. They are of hard wood, generally of lignum-vitæ, or of brass or iron. Sheaves are open or solid in make, when of metal. A *dumb-sheave* is simply a groove in the heel of a topmast for a hawser to lie in. A *patent-sheave* is one having at its centre a brass frame carrying several small brass rollers, inside which the pin is put. The friction is absorbed by the rollers. A layer of tiers in a coiled rope is a *sheave*.

SHEAVE-HOLE. An aperture cut in a block, mast, or yard, in which a sheave is fitted.

Shebeen. A low groggery frequented by sailors.

Shedders. Female fish during the spawning season.

Sheen-net. A large drag-net.

Sheep-shank. A hitch made in a rope for the purpose of shortening it temporarily. It is made by taking two long bights in a rope, and half hitching each part over an end of this loop.

Sheepshead. A fish caught on the shores of Connecticut and of Long Island, so called from the resemblance of its head to that of a sheep (*Sparus ovis*). It is allied to the gilt-head and sea-bream, and is esteemed delicious food.

Sheer. The upward longitudinal curve of a vessel's deck or sides. The position in which a ship is kept when at anchor, to keep her clear of her anchor. *To sheer off*, to avoid a danger by turning the ship's head away from it. *To break the sheer*, to be forced by wind or wave over the anchor, so as to be in danger of breaking it out.

SHEER-BATTEN. A long and wide batten used in running the sheer-lines upon the ship while building.

SHEER-LINE. See LINE.

SHEER-PLAN. The vertical longitudinal plan of a ship. See PLAN.

SHEER-POLE. An iron rod, fastened to the shrouds just above the dead-eyes, to which the *ratlines* are parallel.

SHEER-RAIL. A rail, molded on the outside, placed along the topsides.

SHEER-SAIL. A drift-sail.

SHEER-STRAKE. In merchant ships, the upper strake, or that strake upon which the plank-sheer rests. In vessels of war, the strake worked above the ports and nearest to the deck, and which forms the chief strength of the topsides.

SHEER-WALES. The same as *middle-wales*.

Sheers. Sheers consist of two or more spars raised at an angle, lashed and supported by guys, and having purchases attached by means of which masts are raised, or any other heavy weight lifted. *Stationary sheers* are erected in navy-yards, and are of various patterns, the most ordinary kind being two inclined spars, supported by ropes or chains, and two breasting spars or skids. Movable sheers are temporary structures erected on board a ship for the purpose of moving her masts. (See MASTING.) Sometimes sheers are erected on a movable vessel, called a *sheer-hulk*. Sheers are often replaced by heavy cranes worked by steam.

SHEER-HULK. An old ship fitted with sheers, etc., for masting. Figuratively, an old sailor worn out in the service.

SHEER-LASHING. A lash passed about the head of the sheers.

SHEER-MAST. A mast made of two spars like sheers, inside which a yard works. Used on Peruvian boats.

Sheet. A rope or chain fastened to the lower corner of a sail, to haul and keep it in place. A *course* has a sheet and a tack at each lower corner. When before the wind, both sheets are hauled aft, but only the lee sheet under other circumstances. Other square-sails use both sheets when the sail is set. The stay-sail, jibs, and try-sails have a sheet at their lower after corner only. The studding-sails have two sheets at their lower inner corner only. The sheets are all named after the sails which they extend. *Sheet home!* An order to haul on the sheets of a sail, until the sail is as close to the yard, boom, or deck as it may be. A *sheet in the wind*, half-tipsy, fuddled. *Both sheets in the wind*, very drunk.

SHEET-ANCHOR, or WAIST-ANCHOR. An anchor stowed on shores in the waist outside the ship, in the wake of the fore-sheet, on either side. Formerly the sheet-anchor was the heaviest. By the allowance-book, bowers and sheets are of the same weight in the navy.

SHEET-BEND. A bend made by passing the end of a rope through a bight in another, round both parts and under its own part.

SHEET-BITTS. Bitts for the sheet-chain. Bitts near the mast, to belay the topsail-sheets to.

SHEET-CHAIN, or SHEET-CABLE. The cable or chain used with the sheet-anchor. They are furnished to the navy 15 fathoms shorter than the bower-cables, but of the same diameter.

Sheet-fish. A large fish, the *Siluris glanis*.

Sheet Flue-boiler. A boiler in which the flues are made of sheets or plates riveted together. The cross-section of the flues may be circular, rectangular, oval, or of any arbitrary form.

Sheets. The sheets of a boat are the spaces in the forward and after ends, unoccupied by rowers, called the *fore-sheets* and the *stern-sheets.*

Sheldrake. The duck, *Tadorna vulpanser.*

Shelf. A sand-bank bounded by a ledge of rocks. A shelf-piece.

Shelf-pieces. Strakes of thick plank, running along inside the ship, to support the ends of the beams.

Sheliak. The star β *Lyræ.*

Shell. A hollow iron shot containing explosive materials, destined to burst at the proper time by a charge contained in it. Powder is generally used for this charge (called the bursting charge), but dynamite and other powerful explosives have been suggested. (See PROJECTILES.) The outside case or envelope of a marine boiler. It is entirely of iron or steel. (See MARINE BOILERS.) The wooden or metal casing covering the sheave of a block. *To shell*, to throw shell into a place so as to thoroughly bombard it.

SHELL-BAG. A bag used for carrying or hoisting shells in on board ship, or for stowing empty shell in.

SHELL-BEARER. A wooden or iron implement for carrying heavy shell.

SHELL-CRANE. An iron stanchion shipped at or near a hatch, for hoisting shell from below.

SHELL-EXTRACTOR. A part of the machinery of a breech-loading rifle, designed to remove the empty shell after each fire.

SHELL-GAUGE. Callipers to gauge the dimensions of shell.

SHELL-GUN. A gun designed particularly for throwing shell.

SHELL-HOUSE. A house on shore for the stowage of shell.

SHELLMAN. One of a gun's crew who provides the gun with shell. In each gun's crew there are two shellmen.

SHELL-POWDER. Powder used for filling shells. It is now the same as *torpedo* powder.

SHELL-ROOM. A room below the berth-deck, constructed and lighted like a magazine, and used to stow loaded shell in.

SHELL-STRAP. An iron strap used to fasten the sabot to the shell.

SHELL-WHIP. A light tackle to whip up shell from below. In monitors, the upper block runs on a bar above, so as to be brought to the muzzle of the gun, or over the shell-room hatch.

Shellac. Melted resin- or gum-lac.

Shell-back. A well-seasoned mariner. An old salt.

Shell-fish. Mollusks or articulates, with a shell-covering, hard or soft.

Shelves. Dangerous shoals, shallows, or rocks, lying immediately under the surface.

Shelving. Gradually rising shoals or land.

Sheratan. The star β *Arietis.*

Shevo. A sailor-entertainment.

Shibah. A small Indian vessel.

Shield-ship. A ship fitted with heavy shields, to protect her guns. An improvement on the *cupola-ship*, it finally became the *turret-ship.*

Shield-tower (*Eng.*). A revolving turret.

Shieve. To row the wrong way. To assist the helmsman in a narrow channel.

Shift. A term applied to the disposing of the butts either in wood planking or iron plating, so that the greatest strength may be secured. A change in direction; as, a shift of wind. A party of men to relieve another party. To alter the position of anything. To replace one thing by another; as, to shift the ballast, to shift the berth, etc.

SHIFTER. An assistant to the ship's cook, who washed, steeped, and shifted the salt provisions.

SHIFTING-BACKSTAYS. Preventer backstays. See BACKSTAY.

SHIFTING-BALLAST. Pigs of iron, bags of sand, etc., used for ballast, and capable of being moved about.

SHIFTING-BOARDS. Wooden bulkheads in a ship's hold, used to separate the cargo.

SHIFTING-CENTRE. See META-CENTRE.

SHIFTING-SAND. Sand that changes its position by the action of tide or current.

Shimal. A severe northwest gale, accompanied by a cloudless sky, in the Persian Gulf.

Shiner. A light-house. The *dace*, a small fish.

Shingle. Coarse gravel or rounded stones.

SHINGLE-TRAMPER (*Eng.*). A coast-guardsman.

Shin Up. To climb up a rope or spar by the hands and legs alone.

Ship. The word ship (from Greek *skaptein*, to scoop out) is popularly used to designate any sea-going vessel larger than an undecked boat. But a ship, technically speaking, is a large vessel carrying from 11 to 12 square-sails on three masts, extended by yards, and also a number of jibs, stay-sails, and other square and fore-and-aft sails.

When we attempt to trace the history of the ship, we lose ourselves in a mass of traditions and conjectures. The early legends of most nations refer to the ship; but little knowledge of its origin and progress is to be gained from such allusions. First dwelling inland, and thence impelled by successive migrations to river, lake, and sea-shore, means of crossing these waters were devised. At first a floating log, then one hollowed out by fire or stone ax, answered the purpose; but larger sheets of water rendered necessary an assemblage of such trunks, and experience increased the buoyancy of such structures by adding a number of inflated skins to them. Others, where timber was scarce, prepared a wicker structure and covered it with bitumen or pitch, and thus crossed a rapid stream. From these primitive canoes (*monoxyles*), wicker-boats (*coracles*), or rafts (*schĕdai*, Gr.; *rates*, Lat.), gradually arose the first ship. Nor are we without legends as to these. Sanchoniathon, a Phœnician writer, informs us that Osoüs (a god) took a tree that a storm had thrown down and that lightning had hollowed out, and with it first ventured on the sea. He also says that Chrysor (*Vulcan*) designed the raft. Strabo ascribes the invention of the latter to Erythras, a king on the Persian Gulf. Isidore ascribes the invention of ships to the Lydians. The first voyage mentioned in the Bible is that of the sons of Noah, in Gen. vii. The ark, the first vessel there mentioned, was but a floating covered raft, 450 feet long, 75 feet broad, and 45 feet high, capable of bearing 15,000 tons. That some kind of vessel was designed before the final separation of the nations seems apparent from the fact that the Sanscrit and the Greek words (*naus*) ship are nearly identical.

The Chaldeans, the earliest historic nation, were doubtless navigators of the Persian Gulf, the Accad rulers being especially alluded to by Isaiah as "exulting in their ships." There originated the sea-god, who under the names of Dagon, Melkarte, Poseidon, and Neptune, endured for many centuries as the prime deity of the mariner. Thence emigrated the Phœnicians, carrying their sea-knowledge with them to the Mediterranean. The succeeding Assyrian, Median, and Persian states were non-maritime, and they and the Jewish kingdom had no influence in the development of the ship. When Sennacherib and Sargon conquered Phœnicia, the ships of that commercial state were used by them in further conquests, and by their aid Cypress was taken and Susa conquered. The earlier Assyrian sculptures show us only boats of reeds, and rafts of logs and inflated skins; but after these conquests, we see represented vessels with one or two banks of oars, evidently Phœnician, with sharp prow and high stern, or with equally high and curved stem and stern. Some of these were 40 feet long, and were rowed by from 18 to 22 men.

The Lydians, Carians, Cilicians, and other nations on the Asiatic sea-board, noted for their early piractical exploits, seem to have acquired their maritime knowledge from Phœnicia.

Egypt, whose monuments give us more exact notions as to her ships, was essentially a non-maritime state, although bordering on the sea. Her people detested and feared the sea, regarded salt water as defiling, and deemed it a disgrace to be buried in the sea. Mariners were of the lower caste, and only on the sacred Nile did they develop maritime knowledge. Monuments of 2800–2000 B.C. represent ships, and an inscription of King Una (2000 B.C.) mentions war-vessels, one assisting to tow boats laden with stone for the Pyramids. But until the advent of foreigners the Egyptians knew little of the sea, and it was only when Carians, Lybians, Phœnicians, and Cyprians brought them ships that they began to make conquests by sea.

The smaller boats used on the Nile were made of papyrus, and the larger, of short planks of acacia, overlapped at the edges, and calked with papyrus. Small vessels were propelled by poles, and larger ones by oars and sails, and the force of the current was utilized in coming down-stream. One of the oldest vessels shown on the monuments has 40 oars, and is probably 100 feet long. It had a double mast made of two spars, and a large square-sail bent to a yard, and managed by sheets and braces. Later, vessels are shown, both war and merchant, with one mast and one square-sail, spread between two yards revolving about the mast in a kind of boxing Rameses II. had a large fleet of war-galleys, and is said to have equipped 300 ships on the Red Sea. Vessels were highly ornamented, the lotus and sacred animals being painted on oar, rudder, prow, and stern, and the sails were sometimes embroidered and ornamented in colors. King Pepi, of the 6th dynasty, is said to have sent the first expedition beyond the mouth of the Nile.

But the great maritime people of antiquity were the Phœnicians, whose ships monopolized the entire trade of the Mediterranean for many centuries, and whose merchant fleets sailed from the Syrian Sea into the Ægean, the Euxine, and Tyrrhenian Seas, and to the Western Mediterranean, and established colonies that perpetuated their maritime renown. They furnished the models for war and merchant vessels to all the surrounding nations, the *Gauli*, or round ships, and the *Arco*, or long ship (query, *Ark? Argo?*), distinguishing the classes. We know from Assyrian sculptures that they invented the bireme, with 2 ranks of oars, and Clement of Alexandria says they first planned the trireme, with 3 ranks, imparting the knowledge to the Corinthians, usually credited with its invention. Greek ships were closely modeled from Phœnician, and it was the misfortune of this unwarlike and commercial people to be a frequent conquest of other and more mighty powers. Thus they furnished fleets to Egypt, Assyria, Persia, and Judea.

The earliest beginnings of the Greeks are connected with navigation and ships. Such beginnings extend back into the heroic ages, and can only be traced in the numerous myths and legends handed down through various sources. So the stories of the advent of Danaus, Cecrops, Inachus, and others, doubtless involve voyages of settlement and discovery, while the legends of Pegasus, Phryxus, Perseus, Icarus, and the Rapes of Europa and Io refer to the first appearance of the ship. Dardanus is said to have come to Troy, after the flood, in a leather-covered boat. The Homeric vessels at the siege of Troy were small undecked boats, carrying from 50 to 120 men, hauled up on shore when not in use, and even carried when necessary. The first long voyage of Greek ships is typified in the story of the Argo. Long before the western Greeks were interested in the revival of navigation, those of the Asiatic towns and the islands were hardy and skillful navigators, and planted many maritime colonies. Minos of Crete first subdued the Carian and Cilician pirates, and is said to have possessed the first marine. The larger islands, Samos, Chios, Lesbos, followed after Crete, and as the Corcyran, Corinthian, and Athenian states became interested in maritime affairs, the ship was perfected more and more, the war-vessel particularly improved, and the Greeks gradually succeeded the Phœnicians as masters of the Eastern Sea. When the great conqueror established the Macedonian empire, a new impulse was given to navigation, and the Indian Ocean, hitherto unknown to the Greek mariners, was soon regularly traversed by their keels. The Ptolemies were especial patrons of the maritime arts, and the foundation of Alexandria favored them in advancing trade and commerce.

The Carthaginians followed in the wake of their illustrious predecessors, the Phœnicians. Commerce was their aim, as it had been that of their ancestors, but instead of succumbing to the attacks of their enemy, they resolutely contended against the power of Rome, developing the war-ship in the course of the struggle in which they finally perished. They are said to have first built the quadrireme and the quinquereme, with their 4 and 5 ranks of oars. They extended farther the navigation of their predecessors, sailing beyond the pillars of Hercules, as far as the Scilly Islands north, and Cape Bon south, and even, if we rightly interpret the tradition, circumnavigated Africa.

Their enemies, the Romans, at first ignorant of nautical matters, copied their ships and launched huge fleets in incredible spaces of time. They designed new means of contending against their enemies and developed the war-vessel to some extent. The various Greek colonies in Italy and Sicily aided in developing the ship, and the Phoçæan colony of Marseilles has not yet lost the prestige early gained in maritime affairs.

The Arabians and Indians are said to have possessed ships and to have navigated the waters nearest them at an early date, but we know little of them. The Parthians and most barbarians known to the Romans were non-maritime peoples, and only a few possessed boats of leather or canvas. Nor do we know any reliable facts as to the great antiquity claimed by the Chinese to maritime skill and invention.

Having thus brought the history of the ship down to mediæval times, we will glance briefly at the ancient ship, as given to us in the writings of the Greeks and Romans.

Ancient ships were divided into two great classes,—the war-ship or long ship (*neēs makrai*, Gr.; *navis longa*, Lat.); and the merchant or round ship (*stroggulē*, Gr.; *navis onerariæ*, Lat.). The Greeks called the real fighting-ships *Tacheiai*, the transports, *Stratiōdēs*, for men, and *Hippagōgēs*, for horses.

The long ships were row-galleys seven or eight times as long as broad. No question has been more unsatisfactorily discussed than that of the arrangement of the oars in these galleys. At first, they seem to have been designated by the number of rowers, as *Eisosoroi*, singly rowed, *Triacontoroi*, 30-oared, *Pentekontoroi*, 50-oared, *Exakontoroi*, 60-oared, and others, all classed as *Monokrotos*, or with one rank of oars. But later, vessels with more rows of oars were planned (*Polykrotos*), and we find the *Diereis*, or *Biremis*, the *Trieris*, or *Trireme*, the *Tetreis*, or *Quadrireme*, the *Pentereis*, or *Quinquereme*, the *Hexereis*, or *Sexireme*, the *Heptereis*, the *Oktoreis*, the *Dekereis*, or *Decireme*, carrying respectively 2, 3, 4, 5, 6, 7, 8, and 10 ranks of oars, and we even hear of the *Ekkaidekereis*, *Pentekondekereis*, and *Tessakontereis*, of 15, 16, and 25 banks of oars. Some authorities now believe that in the case of galleys above 5 ranks of oars, the perpendicular groups are understood to be numbered, and not the horizontal rows. The *Hexereis* and *Heptereis* are said to have been invented by Dionysius II., tyrant of Syracuse.

The men rowed the oars seated on benches, one to an oar. The oars were 4 feet apart, those of each row 1 foot in advance of that below, and 2 feet above it. The lower rank of rowers were called *Thalamitai*, the next *Zugitai*, the third *Thranitai*, the fourth *Tetreritai*, and the fifth *Penteritai*. The oars were 7½, 10½, 13½, 16½, and 19½ feet long, and the third row was 5½ feet above the water, the fifth 8 feet. The shape of the galley in section was like a V, expanded at the top. Ships were built with keels, ribs, beams, stem and stern-post as now. At first, only a partial deck extended along the sides, serving as a deck for the *Epibatai*, or fighting men, but these are said to have been joined in a deck by Cimon at the battle of the Eurymedon. The stem rose in a curved ornament, shaped like a gooseneck turned back (*Cheniscus*), and over the stern was a leaf-shaped shelter, the *Aplustre*.

One mast, with a square-sail set on a yard, was used, and sometimes two. Triremes were generally used by the Greeks, and quadriremes and quinqueremes by the Romans. The trireme usually had a crew of 200 rowers and 30 marines. At or near the water-line, sharp prows were added to serve as rams, three or more being sometimes seen. The Romans added square towers to the decks of their ships, and employed military engines on their decks. About the time of the battle of Actium (30 B.C.) the *Liburnian galleys* came into use. We know little of them, except that they were light and handy,—a reaction against the ponderous, many-oared galleys then in use.

Besides being shorter proportionately, the merchant ships were shaped alike at bow and stern. They were sometimes large, able to carry from 200 to 800 passengers. They used 3 masts, the sails on the middle one being the largest, and there being sometimes 3 on that mast. The Romans used in some vessels triangular topsails, called *Suppara* (*shift*). Many sailing-ships made good passages, vying with our modern sailing-vessels, and the galleys made, on occasions, still better speed, 8 to 9 knots not being uncommon. The rudder was always a paddle over the stern, there generally being two, one on each side.

During the Middle Ages the modern ship had its rise. At first the progress of improvement was slow. Upon extinguishing ancient civilization, the Northern barbarians were at first unmindful of the necessity of a naval force to the peoples living on the border of the great sea, and neglected maritime affairs. The Vandals, however, found that the aid of a fleet was necessary to the conquest of the African provinces, and Genseric availed himself of the skill of others to create one. The boats used on the Black Sea were but frail ones, and the lower Latin empire did little toward developing the ship. The Arabians, or Saracens, after overrunning Africa and Spain, engaged in building large ships, but they were somewhat unwieldy and cumbrous. The Rhodian power was prominent early in maritime affairs, and gave the first code of maritime laws to the world. The northern nations of Europe appear early in the Middle Ages as daring seamen, pirates, and fishermen, and their early legends repeat the many heroic deeds of the vikings and their contemporaries. They were the first to undertake long voyages out of sight of land, and first crossed the Atlantic, a terror to the mariner of the Mediterranean. They gave a powerful impulse to the development and improvement of the sailing-ship. The Saxons, after acquiring England, neglected marine affairs until the advent of the piratical Danes led Alfred to found a naval force to repel their incursions. Toward the middle of the period we are considering, the gradual rise of the nations of Europe, the founding and growth of the Norman, Venetian, Genoese, and Catalan states gave a remarkable impulse to maritime affairs. Ships increased in number, variety, and types, and while merchant fleets covered the Mediterranean, the jealousy of these maritime powers developed great fleets of formidable row-galleys. The Crusades aided materially in the development of navigation, by leading English, French, and Flemish powers to send ships on longer voyages, and acquainting them with Medi-

terranean ships. Then followed the introduction of the mariner's compass, the invention of ordnance, and of maps and instrúments of navigation, all directly affecting the ship and rendering possible the great discoveries of the next century, with which, undertaken by Portuguese, Spanish, and English, we close the Middle Ages, with the ship proper fully developed into a strong and stable structure, able to buffet the waves of the Atlantic, and to undertake greater triumphs in the future.

The vessels of the Middle Ages, infinite in variety of class and size, are all referable to one of three classes, viz.: 1. The row-galley, comprising many types, the chief of which were the pinaza, galiot, gatte, saette, fuste, brigantine, dromon, galardella, galea, galea bastarda, galea grossa, galeide, galeasse, chelande, ramberge, pamphyle, and demi-galère, and in the North, the esneke, drakar, and jarnbaud. 2. The sailing-ship, navis, naos, nef, or navire. This comprised a very numerous class, among which we find the nao, balaena, carabella or caravelle, tartane, coca or cog, galleon, zelander, huissier, buzo or buss, gumbari, carracca or carrack, taride, grip, heu, hokebot, aak, flibot, barca or bark, barkane, bardetta, brigantina or bergantin, caravellone, caramoussal, frégate, frégatone, maone, marsillane, and palandra. 3. A mixed class, including the selandra-pamphyle, zelandra-huissia, buzo-navis, and others. These vessels differed *inter se* as to form, size, sail-rig, number, and arrangement of oars, etc.

First, then, as to galleys. These vessels resembled each other greatly. As in ancient times, they were long, narrow, and low-built vessels, principally propelled by oars. But they differed from those of antiquity in having seldom more than one row of oars. These oars were sometimes arranged as in the modern boat, with one man to an oar. The number of banks on each side varied from 8 to 36, with sometimes a bank less on the port side, to make room for the cooking-place. Other galleys had 2, 3, 4, 5, 6, and 7 men to an oar, thus increasing the power without lengthening the galley. Three were more common in the 14th century, and 4 in the 16th, in the light, or *subtile* galley. The bastard galleys, or larger ones, increased this to 5 and 6 men to the oar, and the chief galley, or capitana, and King's galley, or reale, usually had 6 to an oar. Seven to an oar was rarely found, but galleys with 5 to the former half and 6 to the after half, or some such arrangement, were not uncommon.

Nor was this the only way of arranging the oars. We also find galleys with more than one oar to a bank, two or more coming through the same port, and each being managed by one man. Two oars to a bank was a common arrangement in the 14th century, while we find 3 in the 15th, and 4 and 5 in the 16th centuries. There is also mention of a galley with 7 oars to a bank, but it was not successful.

These galleys, then, either rowed *à sencille*, that is, with one man to an oar, or *di scaloccio*, that is, with many men to the same oar, had for a crew from 100 to 250 men. These were in later times slaves or convicts, and were chained to the banks night and day, protected from the sun only by an awning, and exposed to the water coming in the low row-ports. The banks were, with one oar to a bank, perpendicular to the keel, but when many oars were rowed from the same bank, it was at an oblique angle to the keel. The forecastle and poop were sometimes decked over, sometimes occupied by houses or cabins, and were connected by a central gangway, on which the mates promenaded, applying whip and voice to quicken the labors at the oar. After the introduction of artillery, the guns were at first only mounted to fire ahead, under a parapet or *rambade*, then a few were placed between the oars in broadside.

Two masts with square-, lug-, or lateen-sails, and occasionally a third small mast, furnished the auxiliary sail-power to the galley.

The forward or, in case of three, the middle mast carried the largest sail. Upper sails were seldom used on the galleys.

A galley with 25 oars to a side was 125 feet long, 16 wide, in the 14th century, while the French galley, a century later, was 150 feet long, 30 wide. The hold of the galley was divided into store-rooms, cabins, etc., and a *tavern*, where wine was sold to the slaves.

The galiot, pinaza, saette, fuste, ramberge, frégate, frégatone, galea, galeardella, galeide, demi-galère, and brigantine were smaller than the galley, as were the row-galleys of the Northern nations. The taride, the galea grossa, the pamphyle, chelande, dromon, and galeasse were large galleys. Besides these, there were many others of this class, but these are the principal ones.

The speed of the galleys when under full way was considerable, and 9 or 10 knots were not uncommonly attained.

The galley was a shallow vessel, and its walls were prolonged by knees, forming projecting supports for the oars and for the stanchions supporting the awning.

An equally great variety of sailing-vessels meets us in the Middle Ages. The sailing-ship was called navis, nave, or nef, with diminutives of these words. These vessels differed greatly in size, and increased generally toward the end of the period. These were ships of one, two, and three decks, and of various dimensions, but their general characteristics were the same, they being short, round vessels, built for carrying and not for speed, and with bow and stern alike in some cases, but not always. Their sail-rig was equally varied. One, two, three, and four masts were used, and one, two, and three sails on those masts, in form lateen, lug, square, or trapezoidal. These ships were, toward the end of the 13th century, from 1000 to 1500 tons burden, carrying, some of them, from 500 to 1000 passengers. The ships of the Normans were smaller, and those used in the invasions of France and England were but large open boats with one sail on a single mast, and this rig of one square-sail on one mast was a common one in the smaller vessels of the 11th to the 13th centuries. The nefs were short and round, with bluff bows and square sterns, and forecastle and poop began to rise in height in the 15th century. Lateen-sails, used at first on the larger ships, were gradually replaced by square-sails, except in the case of main and mizzen, which remained lateen-sails. At first paddles were used to steer by, but the rudder came into use in the 14th century, and was soon universal. The galion was longer and

finer than the nef, and became the largest of the class, equaled by the carrick, a high, broad, unwieldy vessel, of some 150 to 165 feet long, and from 40 to 47 broad, and carrying upwards of 1000 tons burden. The marsillane was a large, square-sterned vessel; the hokebot a short, round Dutch fishing-boat. Maones were large and unwieldy Turkish vessels. Tarides were large transports, and uissiers were horse transports, capable of carrying 40 horses. The caramoussal was another large, unwieldy Turkish vessel, and palandries were Turkish transports. Caravelles were small lateen-rigged vessels, from 50 to 150 tons burden. Columbus made his voyages in such vessels, which were fast, handy, and easily managed, and were much used in the 15th and 16th centuries. Buches were also large vessels, baleiniers short, high-pooped fishing-vessels, and gumbaries large sailing war-vessels. Tartanes were moderate-sized, and the zelandre was a sailing-vessel of 90 to 100 tons in the 13th century.

The grip, heu, aak, and flibot were small coasting-vessels, and the bark was a small vessel with two masts, having single sails on each. Its diminutive, the barchetta, and its augmentative, the barkasse, resembled it in form and appearance. The brigantine was a small, rapid vessel, much in favor among pirates.

The frégate of the Middle Ages was a small lateen-rigged vessel with one mast and undecked, and the frégatone a larger vessel of the same class.

The vessels of the third class resembled both the galley and the nef, partaking of the rig of one and the characteristics of the other. These were not numerous, and merit no particular description.

We are thus brought down to the 16th century. We have seen larger and more seaworthy vessels resulting from the commercial rivalry of the Italian states and the establishment of modern naval powers, and we may thus commence the modern epoch with ships fitted to make those great voyages of discovery which soon followed.

The conquest of Constantinople by the Turks had checked maritime development, and the decay of the Italian maritime states had an equally depressing effect. But the rise of more lasting powers on the Atlantic coasts, and their voyages for gain and discoveries, gave an impulse to the improvement of the ship, while the contests for supremacy on the ocean in which they became involved, also improved and enlarged the war-vessel. Spain and Portugal at first, then England, France, and Holland, were noted for superior and improved vessels, as their successive discoveries led them to make regular voyages. The formation and development of trading companies had their share in the nautical march of improvement. The permanent navies established by these nations to defend their merchant fleets soon grew in size, and improved the qualities of their ships. War-galleys, hitherto relied upon in the tranquil Mediterranean, would no longer do for the more stormy Atlantic, and the sailing ship of war had then its real rise and development. To the clumsily-shaped hull succeeded scientifically-constructed models of great beauty. To the lateen-sail succeeded the square-sail, and this, in turn, was partially displaced by the trapezoidal sail in small vessels. With the revival of science, the principles affecting the form and conduct of the ship were established, and scientific construction gave better vessels and greater speed. Investigations into the effects and properties of waves, of the wind on the sails, of means of preserving wood, and the ship's bottom, further benefited the construction of the ship. Artillery increased in size and power, and the warship became larger and of stronger build, until, in the 18th century, the ship of the line of 110 to 120 guns reached the highest development of the fighting-ship of the sail period. The high and unwieldy poop and prow at first were cut down, then a century later the square stern, loaded with sculpture and ornaments, was abolished, and the ship more nearly approached its present form and more useful proportions.

The use of iron, first as an aid in building spars, then for the frame, and finally for the rigging and spars of the ship, gave greater solidity and lightness. Iron was first proposed for frames in 1809, and the first iron ship was built in 1818, the "Vulcan," on the Clyde River. But the first sea-going iron vessel was the "Elburkah," of 55 tons. Improvements in sail-rig followed. Double topsail yards, giving greater command of the sails with fewer men, were invented by Mr. Forbes in 1845. Other improvements in the form, construction, and conduct of the sailing-vessel were made, until the clipper, the most perfect sailing-vessel of all ages, was designed, and speed increased from 8, 9, and 10 knots to 15 and 18.

Before tracing further the history of the ship, we must go back to the first beginning of a new power in propelling ships. Sailing-vessels, with all the improvements, were yet dependent on wind and tide; but steam came to the aid of the mariner when most needed, in the increased commercial intercourse of modern times, and rendered him independent of adverse winds or tides.

This is not the place to trace the steps that led to the final construction of the steam-engine. From Blasco de Garay in 1543, to Fulton in 1793–1800, these experiments and preliminary steps were made, finally resulting in the marine engine. The first successful application of steam to move a vessel was that of Fitch, in 1786; and Fulton, in 1809, built the "Clermont," the first regular steamer to ply on rivers. Bell, in 1811, built the "Comet," the first steamer in England. The screw-propeller was the next improvement. It was first applied to steam-vessels in 1836, the "F. B. Ogden," built by Ericcson, being the first screw-vessel. The first steam man-of-war was the "Comet," built in 1819, in England; and the "Princeton," built in 1841, was the first screw man-of-war. The first line of steam-vessels was established in 1822, in English waters. The "Savannah," in 1819, first crossed the ocean by the aid of steam, but a transatlantic line was only established in 1838. The first of the present great lines was the Cunard, in 1840. Up to this time the average speed obtained was from 7½ to 9 knots, and the greatest 11 knots, per hour. Other lines were soon established, and regular communication by steam is now maintained all over the world. As steamers thus came into use, it was found that wood was still less fit for their frames and hulls, and iron rapidly replaced it. Steamers

grew rapidly in size, the first being 40 to 60 tons, until on the establishment of the transatlantic lines they had risen to 1200 and even 2000. The short and broad hull of the sailing-vessel was lengthened, and the lines of the steamer became longer and finer, until it attained the proportions of the old row-galleys. The sailing-vessel had been in length from 4 to 5 times the breadth, and now the steamer reached 9 and 10 times its breadth. The "Great Britain," built in 1843, reached a great size, being 322 feet long and 50 broad, and carrying 2984 tons, with engines of 1000 horse-power. But considerable sail-power was still retained in her 6 masts, 2 of them square-rigged. This increase in size culminated in the "Great Eastern," launched in 1858. This enormous structure was a double keelless iron vessel, with several compartments, separated by water-tight bulk-heads. She is 692 feet long and 85 broad, with a total tonnage of 22,500, and was intended to accommodate 4000 passengers, or 10,000 soldiers. One hundred and ten furnaces, under 10 boilers, supplied the motive-power to the 4 paddle- and 4 screw-engines, besides furnishing steam to the 6 smaller engines of 300 to 400 horse-power. These engines of 2600 nominal, or 11,000 actual horse-power, are able to move the enormous hull at the rate of 14 miles an hour. Twenty large boats are carried on davits, and 2 steamers 100 feet long may be carried on the guards. She also had 6 masts, the second, third, and fourth only being square-rigged. But her great draft (30 feet), and the cost of running her, has made her unprofitable as a passenger steamer, and her principal use has been to lay telegraph-cables, for which her great size and steadiness fit her.

The most successful vessels of the great ocean lines, although they fall far short of this monster, are still of great size. The "City of Berlin" of 5000 tons, the "Sardinian" of 4200, the "Scythia" of 4557, and the "Iberia" of 4761, are among the largest. An average of 3000 tons is not uncommon. Many of these steamers have 4 masts, others 3, but sail is always auxiliary, steam being the chief reliance. Enormous fleets of these steamers are now possessed by the great steam lines of the world. In 1875 the Cunard line had 49 vessels of 90,000 tons and 14,500 horse-power; the Inman line, 16 of 44,000 tons and 7000 horse-power; the Allen line, 20 of 54,000 tons and 8000 horse-power; the Anchor line, 30 of 70,000 tons and 15,000 horse-power; the Royal Mail, 23 of 51,000 tons and 9300 horse power; the Pacific Company, 54 of 119,800 tons and 21,395 horse-power; the Liverpool and River Plate Company, 30 of 32,995 horse-power; the Peninsular and Oriental Company, 50 steamers of 122,030 tons and 22,000 horse-power; and the Messageries Maritimes of France, the largest number of all, 66 steamers of 175,000 tons.

Since the adoption of iron for the frames and hulls of steamers, the growth of these vessels has been very rapid. In 1861 there were 159 iron vessels of 68,560 tons built in England, the chief mart of this trade; and in 1867, 224 of 90,823 tons; in 1872, 446 of 335,750 tons. In all, in 13 years, there were built there 4185 steamers of 2,489,840 tons.

While iron ships increased, steam-vessels also replaced sailing-ships rapidly. The decrease of sailing-vessels from 1870 to 1873 was 5.44 per cent. in numbers, or 11.57 per cent. in tonnage; also 6.67 per cent. in size. On the contrary, steamers increased in number 54.9 per cent., in tonnage 24.59 per cent., and in size 6.67 per cent. In 1876 there were 5771 steamers of 5,506,842 tons, and 58,208 sailing-vessels of 15,553,338 tons. Steel has also been used to some extent in building ships. There were some built as early as 1860; but only 3 were built from 1866 to 1876, and one in 1878. That year 574,819 tons of shipping were built in England, of which 52,657 was of wood, 517,692 of iron, and 4470 of steel; or 9 per cent. of wood, 3.4 per cent. of steel, and 87.6 per cent. of iron. A steel ship is now building for the White Star line, which is to be 546 feet long, 50 feet beam, and more than 8500 tons in burden.

But when we come to look at the modern man-of-war, we find more remarkable changes during the modern period. At the beginning of the 16th century, the row-galley was still the main reliance in the fleets of European powers. But as we have seen, it was already being replaced by the sailing war-vessel. As this took place the vessels increased in size, improved in sail-rig and in construction, and the enormous structures on poop and forecastle were leveled to the deck. Ports, usually ascribed to Descharges, of Brest, were invented before his time, and guns were mounted in broadside in the sailing-vessel.

The fleets of sailing-ships that during the 17th and 18th centuries contended for supremacy were principally made up of those lofty three-deckers, —short, high, and unwieldy, but formidable from the number of guns they carried, and necessarily opposed to them were ships of the same class. This supremacy of the ship of the line was weakened by the introduction of the steam-vessel and by the construction of heavier frigates. This, the next vessel in size, gradually attained a greater importance as its dimensions increased. So long as the paddle-wheel was in use, steamers were not of great size, but the introduction of the propeller again brought vessels of the line into use; but their importance as a fighting-vessel had ceased, and comparatively few steam-liners were built. With the introduction of the screw the sailing man-of-war was doomed, and steam-vessels thenceforth took the first rank in all navies. Wood is still used for unarmored vessels, but is being replaced by iron, and armored ships are built of iron or steel. The latter material is taking a decided place in war-ship construction. Eight unarmored corvettes are building for the English navy, and steel has been used in the construction of some recent armored vessels. The advent of the armored ship has totally changed the types of vessels for war, and all unarmored vessels are now only adjuncts to the more powerful protected ships. The introduction of armor has caused extensive changes in construction to meet the demands for greater strength and rigidity, and the latest men-of-war differ totally from those of fifty years ago. Better engines, with greater power, have also resulted from the construction of such heavy and ponderous vessels. The unarmored steam-vessel has gradually increased in size, until sloops exceed in size the line-of-battle ships of the 18th century, and armored ships have gradually increased

in size also. In the middle of the 16th century, the "Henry Grace à Dieu," regarded as unusually large, was no more than 1000 tons, although her high poop and forecastle gave her the appearance of greater size. A century later we find the great "Royal Sovereign," the largest man-of-war then built, and the first English three-decker, to be 232 feet long by 50 wide, and only 1861 tons burden.

Still a century later, and the "Royal George," of melancholy fate, the greatest ship of her time, was only 190 feet on the middle deck, 52 feet broad, and 2280 tons burden. But at the end of this 18th century we find the Spanish "San José" to have increased to 2457 tons, being 194 feet on the middle deck, by 54 beam, and carrying 112 guns, while the English "Caledonia," the largest of the old wooden liners, was 205 feet long, 54 beam, and 2616 tons burden, with 120 guns. Not the less remarkable is the increase in size of steam war-vessels. The first, the "Comet," was 238 tons, and of 80 horse-power. This was in 1822, and five years later the "Carron" measured 494 tons, and her engines were 120 horse-power. In 1830, the "Medea," of 835 tons and 220 horse-power, was in use, and in 1839, these dimensions had increased to 1195 tons in the "Cyclops," of 320 horse-power. In 1843, the "Albert and Victoria" yacht measured 1442 tons, with engines of 400 horse-power, and in 1845 the "Terrible," of 1850 tons and 800 horse-power, was built. In 1846, the "Dauntless," of 2432 tons, was 218 feet long and 39 beam. Iron ships then carried further this increase in size. The French built seven 120-gun ships in 1845 which were over 5000 tons displacement, and in dimensions 210 feet by 51. Armored ships checked this development at first, then carried it to greater lengths. We find the "Warrior," the first English ironclad, to be 380 feet long, 58 beam, and of 9681 tons displacement, and the "Northumberland," in 1865, increased this to 10,395 tons, and to 400 feet in length and 59 in breadth of beam. The "Dreadnaught," in 1875, further carried these dimensions to 10,866 tons, but shortened the length to 320 feet, with a beam of 63 feet, and, finally, the "Inflexible" reached 11,520 tons displacement, and with the same length as the "Dreadnaught," increased the breadth to 75 feet. The probable limit in size of armored vessels is reached in the "Italia" and "Lepanto," which are 13,400 tons in displacement, 400 feet long and 74 beam. The noticeable feature in the development of size in steam war-vessels has been the gradual increase of length from a proportion of 5 to 1 of breadth, until 7 and 8 to 1 were reached, and then, as weight of armor increased, these proportions came down, until the "Inflexible" presents a proportion of 4.2 to 1. Modern construction has also brought the weight of the hull down to a minimum of 39 per cent. of the whole weight for iron hulls, and 34 per cent. for steel hulls, from an average of 46 per cent. in the wooden hull. Sail-rig has altered little in the man-of-war, but the gradual adoption of steam as the principal motor has led to a rejection of much of the rig of the sailing-vessel, the lighter sails being dispensed with in steamers, and sail-power entirely discarded in certain classes of heavy armored vessels.

While the types of modern ships are perhaps as numerous as at any time in the history of the ship, they are more easily classified by an artificial system, many of which have been in use. These have reference: 1. To the number of guns. 2. To the tonnage. 3. To the rig of the vessel. 4. As regards the condition of the hull. 5. As to the mode of arranging the defensive armor and battery.

During the 16th and 17th centuries the mode of classifying war-vessels by the number of guns they carried was in common use. We have thus, ships of 120, 112, 100, 98, 86, 82, 80, 74, 64, 60, 56, 50, 44, 40, 38, 36, 32, 28, 24, 22, 20, 18, 16, 14, 12, 10, 8, 6, and 4 guns. These ships were also classed from the number of decks on which guns were carried, as ships of the line (double-deckers and three-deckers), frigates, sloops, pinnaces, etc. As to a classification by tonnage, we find such in use in the Spanish Armada; merchant ships are so classed, and tonnage, or displacement, is made the basis of a classification for modern naval vessels. See CLASSIFICATION.

All ships are classed according to rig, and a description of these vessels will be found under the head of sloop, frigate, bark, barkantine, brig, brigantine, schooner, cutter, polacre, xebec, etc. Modern men-of-war are classed by rates, according to the tonnage, and are also vaguely referred to from the manner of their armament or the arrangement of their armor. A proposed division of these vessels as given below is from the Austrian work "Die Marine," by Von Littrow, with additions. Ships are, by this, classed:

1. By size and draft.
    - A. Sea-going.
    - B. Coasting-vessels.
2. By the materials and system of construction.
    - A. Wooden vessels.
        - *a.* Transverse frames.
        - *b.* Diagonal built.
    - B. Iron vessels.
        - *a.* Transverse frames.
        - *b.* Longitudinal frames.
        - *c.* Bracket frames.
    - C. Iron vessels cased with wood.
    - D. Composite vessels (iron frames and wood planking).
    - E. Steel vessels.
3. According to defensive power.
    - A. Unarmored.
    - B. Armored.
4. According to propelling motor.
    - A. Sailing-vessels.
        - *a.* Ship.
        - *b.* Bark. { 1. Bark. 2. Barkantine.
        - *c.* Brig. { 1. Brig. 2. Brigantine. 3. Hermaphrodite brig.
        - *d.* Three-masted schooner.
        - *e.* Schooner. { 1. True schooner. 2. Topsail schooner.
    - B. Steam-vessels.
        - *a.* Paddle-wheel.
        - *b.* Screw-steamer. { 1. With 1 screw. 2. With 2 screws. 3. With 4 or 6 screws.
        - *c.* Hydraulic reaction ship.
5. According to the destination of the vessel.

- A. Ships of the line.
  - *a.* For home waters.
  - *b.* Sea-going.
  - *c.* Station vessel.
- B. Cruisers.
  - *a.* To capture other cruisers.
  - *b.* To capture mail-steamers.
  - *c.* For cruising and dispatch purposes.
  - *d.* Station gunboats.
- C. Coast defense ships.
  - *a.* Offensive.
  - *b.* Defensive.
- D. Dispatch-vessels.
- E. Transports.
  - *a.* For troops.
  - *b.* For material.
- F. School-ships.
  - *a.* Sea-going.
  - *b.* Not sea-going.
- G. Torpedo ships.
- H. Harbor vessels,—tenders, tugs, pilot-vessels, guard-ships, coal-hulks, powder-hulks, store-hulks, etc.

6. According to the arrangement of guns or of defensive means
   - A. Rigged vessels.
     1. With full battery.
        - *a.* Guns on spar-deck (flush-deck corvette and gunboat).
        - *b.* Guns on 1 covered deck (decked corvette).
        - *c.* Guns on 2 decks (frigates).
        - *d.* Three tiers of guns, 2 covered (two-decker).
        - *e.* Four tiers of guns, 3 covered (three-decker).
     2. With central battery.
        - *a.* Without bow and stern fire.
        - *b.* With 2 chase-guns.
        - *c.* With 3 chase-guns.
        - *d.* With 4 chase-guns.
     3. With turrets.
        - *a.* Fixed.
        - *b.* Movable.
   - B. Mastless ironclads.
     1. Without a central redoubt (monitors).
        - *a.* Single turret.
        - *b.* Double turret.
        - *c.* 3 or 4 turrets.
     2. With central redoubt (breastwork monitor).
        - *a.* With 1 turret.
        - *b.* With 2 turrets.
          1. In line of keel.
          2. Diagonally placed.
   - C. Circular ships.
     - *a.* Popoffkas.
     - *b.* Livadia style.
   - D. With guns *en barbette.*

Under some one of these classes comes each man-of-war, armored or unarmored, steam and sail, and all merchant vessels.

In the matter of speed great progress has been made. As many as 17 knots and even 18 has been attained by the larger ships among the men-of-war, and from 23 to 25 miles an hour has been made by merchant steamers, while the smaller torpedo-boats attain this great speed, and are expected to surpass it. The modern man-of-war is a mass of machinery, and reliance is wholly placed upon the engines in case of a battle, as was anciently placed in the oar-power. The limit as to size has been attained, both in men-of-war and merchantmen, and much greater speed cannot be expected, while the gun has triumphed over the armor, so that development in that direction seems checked.—*F. S. Bassett, Lieutenant U.S.N.*

Shipboard. *On shipboard*, on board a ship.

Ship-breaker. One who breaks old ships in pieces when no longer fit for use.

Ship-broker. A mercantile agent who transacts business for ship-owners and merchants, buying and selling ships, procuring cargoes, etc.

Ship-builder. A shipwright; one who builds ships.

Ship-building, Iron. By the substitution of iron for wood as ship-building material the general theory of naval architecture, including the computations of weights, displacement, centres of gravity, meta-centres and stabilities, strains to which the structure is subjected, speed, etc., is not essentially modified; but in the mechanical execution a radical change is effected, the art of the wood-worker yielding its prominence to that of the iron-worker. The saw-mill, broad-ax, adz, auger, and treenail are nearly superseded by the furnace, the rolls, the iron-shearing or planing-machine, the drill, punch, and rivet. The labor of the draughtsman, particularly in such matters as the geometrical constructions for joining necessarily short pieces like timbers, is materially diminished; but extreme accuracy is required in laying off the mold and beveling templates of every frame, as there can be no fairing of the body, as by dubbing with an adz in wooden ships, after the structure is placed in position. As iron can be hammered, bent, twisted, riveted, or welded into any conceivable form, and so arranged as to utilize its utmost resistance to all the varied strains to which a ship is subjected, it is eminently adapted to such structures. Experience has amply demonstrated their superiority, both in strength and durability, over wooden ships; also that the latter are incapable of sustaining the steam-power required at the present day. Of the many notable proofs of the strength of iron ships two may be cited, viz., the grounding of the "Great Eastern" in Long Island Sound a few years since, and the recent collision of the Guion steamship "Arizona" with an iceberg in mid-ocean while running at a speed of 15 knots an hour. The former vessel was extricated, after replacing a few plates, without strain to her general structure, the latter continued her voyage after a short delay.

There are three general methods of framing iron ships, viz., the *transverse system*, the *longitudinal system*, and the *bracket system*, which is a combination of the other two. The *solid floor system*, as applied to unarmored vessels of war, is also a combination of the two first mentioned, and in a few instances *diagonal framing* has been attempted, but did not meet with favor.

In the simplest form of framing, which is the *transverse system*, the frames are arranged transversely across the keel in the manner of those of wooden ships. The frame is composed of three parts, viz., the *frame angle-iron*, or outer angle-iron, to which the outer plates are riveted; the *reverse frame*, or inner angle-iron, to which

the ceiling, etc., is fastened, which is curved in a contrary direction and riveted to the frame angle-iron side to side from the top sides to about the turn of the bilge where it begins to diverge, being sufficiently separated at the keel, where it ceases, to give proper depth to the floor; and the *floor-plate*, which extends from the turn of the bilge on one side of the ship to the same point on the other, and to which the flanges of the frame and reverse frame are riveted. When the keel is continuous the floor-plates are in two pieces, but when the floor-plates are in one piece the keel is worked intercostally. The simplest form of keel is a plain bar, of which the *stem-post* and *stern-post* are virtually continuations, the *garboard-strake* being flanged and riveted thereto. The *deck-beams* are commonly of T bulb-iron, the ends being fashioned into arms and riveted to the frames. The *decks* are of wood, but under the planking on either side of the hatches, and riveted to the tops of the beams, are heavy plates of variable width called *stringers*, extending the whole length of the ship. The stringers, together with the *water-ways* and top plating, give most of the strength to the upper chord of the structure. *Side-keelsons*, the chief source of longitudinal strength of the lower portion of transverse framing, are usually worked intercostally, but sometimes altogether inside the reverse frames. The outside plating is *butted* at the ends and *lapped* longitudinally below the water-line; but above the water-line the sides may be made smooth by butting the longitudinal seams also. *Frames* are bent to the mold, after heating them in a reverberatory furnace, upon a large cast-iron plate perforated with square holes, called a *bending slab*.

In the *longitudinal system*, the frames are disposed fore-and-aft the vessel, and are thus better adapted to withstand longitudinal strain, which in long ships is exceptionally severe. The ship is divided by several transverse bulk-heads, and these frames or stringers are so arranged from bulk-head to bulk-head that one passes along the center of every plate of the skin, giving to each strake of plates the continuous strength of an iron beam. Between the bulk-heads the frames are supported by partial bulk-heads, or continuous iron rim, forming a girder running transversely all around the ship. The inner skin, for a great portion of the length of the hull, may be made of plates and calked, thus giving great additional strength, and insuring the vessel against leakage in case of accident to the outer plates.

The *bracket system*, or combination of the transverse and longitudinal systems, is used in ironclad ships. This frame-work consists essentially of two sets of frames, crossing each other at right angles, or nearly so, the plates of the longitudinals being continuous, and those of the transverse frames in short pieces between the longitudinals. The plates in the transverse frames consist of a bracket-plate on each side of the longitudinal, to which they are riveted by means of short pieces of angle-iron. They are also riveted to the continuous reverse angle-iron of the transverse frame, and to the frame angle-iron, which generally consists of short pieces between the longitudinals. Frames connected with water-tight bulk-heads are provided with solid plates. The longitudinals are notched to receive the reverse angle-iron of the transverse frames. The inner skin forms a double bottom for a great portion of the length of the ship, the cellular spaces between being accessible, through man-holes, at all parts. The upper longitudinals extend the whole length of the ship, and turn into breast-hooks, and are arranged to partially sustain the thrust of the ram; the lower ones are stopped at various places, the lowest generally at the termination of the double bottom. Tons are placed above the armor-shelf. Some of the decks of ironclads, particularly armored decks below-water, are deflected near the bow so as to assist in sustaining the thrust of the ram.

All iron vessels should, when practicable, be provided with so many water-tight compartments that two of them can be filled without sinking the ship.—*Albert Aston, Chief Engineer U.S.N.*

SHIP-CANAL. A canal large enough for the passage of ships. See CANAL.

SHIP-CARPENTER. A carpenter who works at ship-building.

SHIP-CHANDLER. A merchant who deals in canvas, rope, tar, and the other supplies necessary to ships.

SHIP-CRAFT. An old word for navigation.

SHIP FEVER. Ship fever has many synonyms, such as "camp fever," "jail fever," "hospital fever," "putrid fever," "spotted fever," etc.

These terms all mean the same thing. Ship fever is *typhus fever*, and always seems to arise under the influence of the same causes.

Some writers of authority seem to have considered it doubtful whether typhus can be generated *de novo*, but that seems now to be entirely set at rest.

At present all admit that the poison, or morbific matter,—the *miasm* which engenders the disease,—can be spontaneously developed wherever great masses of human beings are accumulated, as in great centres of population, in armies concentrated in a place too small in relation to the number of persons, in prisons, and in ships,—crowd-poisoning, in fact. It also occurs in sparse populations, where the lodging and food, as well as the surroundings, are exceptionally bad, as in certain epidemics in Ireland and elsewhere.

This has been particularly the case in penal hulks, owing to overcrowding, causing vitiation of the air by organic impurities, accompanied by deficient ventilation, personal filth, and frequently by impaired condition of system in the prisoners, the result either of insufficient food, improper food, or of scurvy taint.

The improvement in sanitary knowledge has decreased the ravages of typhus enormously, and seems to prove its generation from either criminal or enforced neglect of proper prophylaxis. Hence penal hulks have gradually been abandoned, the reasons for using them being otherwise very good. Hospital-ships, like the "Dreadnought" in the Thames, when long in use come into the same category, and have to be abandoned.

The dreadful mortality in the old "Jersey" prison-ship was probably typhus, and people died there, without recognition or help, in a way that was a disgrace to all the officials concerned. Once developed, ship fever spreads by contagion. The attendants upon the sick may carry the contagion, while they are themselves well. Any

person may carry it who has been exposed to the atmosphere for a comparatively short time.

In ship, or typhus fever, each patient is a focus of infection,—certainly from after the end of the first week up to the period of convalescence. If the patient is confined to a close place, a very few minutes' exposure may enable a visitor to carry away the contagion in his clothing. Medical men, nurses, some prisoners, and other persons exposed to the disease, have been supposed to enjoy a certain immunity, but this idea is a fallacious one, and no one who is in contact with patients affected with it can be certain of exemption.

At the celebrated "Black Assizes" at Oxford; at the Old Bailey trials, in 1750, the prisoners, though apparently well themselves, carried out from their foul wards the seeds of deadly disease to the judges, jury, lawyers, witnesses, and audience.

As has been said, the ravages of typhus, or ship fever, are much less than was formerly the case, owing to enlightened views and proper laws, but they have been very dreadful within our own period. There were epidemics of it in the United States in 1837 and 1850, but it is rare in this country, and did not occur during our late civil war.

Most familiar to us is the "ship fever" which prevailed during the great immigration of the Irish consequent upon the famine of 1847. Our seaport hospitals were then filled to overflowing with "ship fever," and some of us had an opportunity of observing it.

In 1813 the Bavarian army was almost destroyed by this scourge.

In Mayence, in 1813-14, of 60,000 French troops in garrison, there died, of typhus alone, in six months, 25,000. At Metz, during the Franco-German war, it made great ravages. Instances of epidemics on board ship, within comparatively recent times, are too numerous to mention.

Typhus fever, or ship fever, is always popularly confounded with typhoid fever. Their non-identity was really established by Baron Louis, in 1829, and his doctrines were brought to America and established by Gerhard, of Philadelphia, in 1837.

The distinction between the diseases was not recognized in England until much later, and then not fully until Sir William Jenner published his investigations in the London Fever Hospital, an institution in which true typhus may always be found.

It is not necessary, in an article of this nature, to go into an elaborate discrimination between the two diseases, but only to draw a general comparison for those who are left to their own resources. As we have said, they were formerly considered identical, and only varying in severity. It was after medical science took a great step in advance, and in quite recent times, that the difference was admitted,—by some very reluctantly.

Typhus, or ship fever, is confined to no particular age. Typhoid fever seldom attacks those much past youth. The course of typhus is sooner terminated than that of typhoid. The temperature of typhus is higher at first, and falls more rapidly in recovery. The termination of typhus is generally within three weeks, while typhoid generally runs much longer. In typhus there is frequently—indeed, commonly—congestion of the lungs. In typhoid, bronchitis is more apt to occur. Fatal results, in cases of typhus, occur, on an average, about the fourteenth day, while in typhoid they are apt to occur after three weeks. In typhus the urine is albuminous in the early stages, and in typhoid this condition occurs, generally, towards the close. The glands of Peyer, and the mesenteric glands, are sometimes not at all affected in fatal typhus. The spots of typhus remain after death. The spots of typhoid do not.

There is almost invariably diarrhœa in typhoid fever, and there is almost always constipation in typhus.

It is not necessary to give the pathology of the two diseases in this article, but only again to state their non-identity, the misunderstanding of which has sometimes led to great sacrifice of life.

The means to be adopted in case of an outbreak of typhus on board ship, or elsewhere, consists in separation (such as putting on the spar-deck, in boats, etc.), aeration, disinfection, purification, quarantine of attendants, and, especially, in avoiding the establishment of foci.

Ship fever, or typhus, has a comparatively sudden invasion. There is pain and soreness in the back and limbs, a sense of fatigue, uneasiness of the stomach, want of appetite, nausea, mental depression and irritation, and inability to sleep. It is difficult, however, to fix the precise time of attack. After a longer or shorter period of the premonitions given above, the patient is seized with chilliness and increased debility, and is obliged to take to his bed. The cold stage varies in degree and duration, sometimes slight and sometimes severe and protracted, with pale, cold surface, shrunken and anxious features, frequent, irregular, feeble pulse, and great prostration. Death sometimes occurs in this stage, but this is rarely the case.

Generally, febrile reaction comes on, and fever is established, with the usual symptoms of that condition. The pulse is often full, with some strength, but easily compressible, and not so firm as in ordinary fevers of much less gravity.

Nausea and vomiting are often absent throughout the illness. In general, the bowels are costive and require medicine.

Even at an early period of the disease the face is dark red or of a peculiar dusky hue, with injected eyes and very marked congestion about the nares and fauces. The mind is always sluggish and the thoughts confused, even in slight cases, and the pain over the forehead is apt to be exceedingly severe,—described as "bursting."

These symptoms continue for several days, gradually increasing until the disease is at its height. The surface is now universally hot, with little disposition to perspiration, the heat being of that peculiar kind called calor mordax, which communicates to the hand of another a sense of pungency or burning.

The temperature rises to 104° or 106° F., and has been known to go as high as 109°. The pulse is now feeble and frequent, sometimes so rapid as scarcely to be counted. The respiration is also very frequent, and generally feeble and imperfect in the lower and rear portion of the chest. There is apt to be a slight remission of

fever in the early part of the day and an increase in the evening, while there is great stupor during both periods.

The peculiar eruption of typhus often occurs on the fourth or fifth day,—whence one of its names—"spotted fever." The spots are irregular and isolated, or else grouped in irregular patches, looking not unlike measles.

Soon after they appear they become permanent; that is, they do not disappear under pressure. They are confined to no particular part of the body, are light-colored in mild cases and dark in malignant ones; they are true *petechiæ*, in fact. They last 11 or 12 days, usually disappearing before convalescence begins. They are often accompanied or succeeded by the peculiar vesicular eruption called *sudamina*.

By the end of the first week, or when the disease is fairly developed, the tongue is brown and dry, and dark sordes collect upon the teeth, gums, and lips. Sometimes, but not frequently, the tongue seems deep red and glazed, looking like a piece of raw beef.

In typhus there is a total want of appetite; but food is borne by the stomach much more readily than in most other fevers. In exceptional cases the bowels may be loose; but usually they are only moved by medicine, and the dejecta are always dark and most offensive.

There is no marked tendency to tympanitis. The urine is generally very scanty. The dusky hue of the face grows deeper, with great suffusion of the eyes, and a peculiar and characteristic odor exhales from the body, which has been variously described. Some liken it to rotten straw, some to the smell of mice, but it is really *sui generis*, and most resembles that of confined apartments in which numbers of persons, whether sick or not, have been long crowded together without attention to cleanliness or ventilation. When once experienced the odor will always be remembered.

Even at the most grave period of the disease a patient may generally be roused from stupor and made to answer questions, but generally imperfectly and with reluctance. But often he sinks into *coma*, or has delirium, generally low and muttering, with twitching and jerking of the muscles, and picking at the bedclothes. If no favorable change takes place, the patient sinks into the last stage, that of complete prostration, slipping down in the bed, eyes half closed, mouth open, pupils dilated, or else very much contracted, hiccough, tongue like a brown, dry chip, inability to swallow, involuntary discharges from the bowels, suppression of urine, and insensibility of the skin to irritants, coldness of surface, collapsed, ashy face, and pulse imperceptible at the wrist.

No case must be considered hopeless, however, until life is extinct, as wonderful recoveries from this disease have occurred. In fact, it has been regarded as almost a peculiarity of the disease, that persons have been left to die during epidemics, and have been found sitting up and eating the food left beside them.

Sometimes, and generally about the fourteenth day, amelioration of symptoms takes place. The pulse falls, the skin relaxes, the tongue becomes moist and begins to clean, the eruption fades gradually, and the nervous twitchings subside and consciousness returns. This is often preceded by a profuse perspiration, or an unusually profuse discharge of urine. The patient frequently falls into a sound and prolonged sleep, and wakes up a new man. The recovery in such a case is usually rapid; the appetite is often insatiable, and, if indulged in, is apt to lead to relapse.

When recovery takes place from a low condition or from collapse, it is always slow. Supporting remedies must be used, for there is extreme debility to be overcome. The hair is apt to come out, and the skin to peel. The brain and nervous system are slow to recover tone, and the intellect, especially the memory, remains imperfect for a long time. Relapses are rare under proper treatment, and ultimate recovery is generally perfect.

The duration of ship, or typhus fever, is variable. When it terminates favorably it runs a course of about three weeks,—one week in development, one in the formed state, and one in the decline.

It may, if mild, terminate earlier. Some cases run on longer than 21 days. Fatal cases may end at any period. Death sometimes occurs, without reaction, within the first 24 hours. This, of course, is where great susceptibility receives a tremendous dose of the poison. It is not unusual for death to occur about the fifth or sixth day, but usually it takes place some time in the second week, say from the ninth to the twelfth day. Of course it may occur at a much later period.—*E. Shippen.*

Ship-keeper. A watchman employed to take care of a ship when laid up, or in ordinary. An officer who remains much on board.

Ship-language. Language current among sailors.

Ship, Launching of. At the commencement of the building of a ship, the foundations are laid with a view to her launching, and the difficulties to be overcome in the particular situation in which the work is to be performed, are carefully considered and provided for.

Particular care must be taken that the foundation is sufficient to bear the whole weight of the fabric, so that no settling may occur at any time during the progress of the work, or at the time of launching.

If the location requires it, piles are first driven both under the keel and the launching-ways the whole length of the ship, and under the extension of the launching-ways, as far out into the water as is necessary to extend them, that the ship may be floated. Upon these piles, under the keel, are placed the ground-ways, and upon the top of the ground-ways blocks are laid, about 5 feet apart, for the whole length of the ship.

On the top of these blocks, before the keel is laid, other blocks are placed, made wedging, athwartship, from 2 to 3 feet long. These blocks should be carefully selected with reference to the grain of the wood, so that they may be easily split at the time of launching the ship. Upon these blocks the keel rests. The height of this foundation should be laid with reference to the work which is to be done under the bottom of the ship, as well as the descent of the ship into the water. The blocks are laid upon an inclination of from $\frac{5}{8}$ of an inch to 1 inch to the foot.

Great care should be taken in laying the keel, that the forefoot shall not strike the ground-ways

in launching, allowance being made for the settling of the ship during that process.

While the ship is building her weight rests upon the blocks under the keel, and such shores as may be needed under the bilge and sides. When the time of launching comes this weight is to be transferred from these keel-blocks to inclined planes, which are placed one on each side of the keel, called "launching-ways."

These are securely placed upon the top of the "piles" previously prepared and the blocking necessary to bring the ground-, or lower ways, to the required height and inclination.

The surface of these ways should be calculated with reference to the amount of friction coming from the weight to be placed upon them. And it is a good fault that the ways are too wide rather than too narrow.

The ground-ways having been placed, they may be carefully smoothed and laid with precision, either to a gentle curve or a straight line, their entire length, and when ready they may be coated with a preparation of tallow, lampblack, castile soap, and oil in suitable proportions. The sliding-ways may now be hauled up and fitted.

In putting together the sliding-ways, take care that the thin part of the snape comes aft, and that everything is removed that may cause the bilge-ways to catch when the movement commences.

After the sliding-ways are fitted, a ribband is secured to the outside of the ground-ways. Packing, shores, and poppets are built up on the top of the sliding-ways to fit the bottom of the ship, leaving an opening of from 4 to 6 inches, for wedges, between the sliding-plank and the packing,—these wedges being for the purpose of lifting the ship from the keel-blocks and transferring the weights to the sliding-ways. The packing spoken of may be carried as far forward and aft as the sliding-ways, or as far as the shape of the ship will permit.

If poppets or short shores are used, they should be secured at the ends to each other and to the plank above the wedges, in order that it may be like a solid mass of wood, trussed and secured with chains under the keel, from side to side.

The ribbands having been secured to the ground-ways, and the whole of the new fabric upon which the ship is to rest well shored and braced, the foundation is complete for transferring the weight of the ship from the keel-blocks to the launching-ways.

While the packing or chocks are being fitted, wedges of large size are fitted between these chocks and the sliding-ways fore and aft, close together.

When this work is all done it is usual to shore up and secure the packing to the bottom of the ship, and push the sliding-ways in toward the ship, in order to give them a final coat of the launching composition of tallow, oil, soap, etc. The sliding-ways being thoroughly coated, they are pushed back into their places and the wedges inserted fore and aft, leaving about one-half of their length outside of the packing. The ends of the launching-ways are now secured to the ground-ways.

The anchors being ready for letting go, and every arrangement having been made which is necessary to check the vessel after she has left the ways, the word is given to "wedge up." The men, provided with heavy sledges or battering-rams, wedge up on both sides for a sufficient time to raise the whole mass slightly from the keel-blocks, and the weight is thus transferred to the sliding-ways.

Now commences the exciting part of the launch. The blocks are removed one by one, commencing at the after end, usually by splitting out the wedge-pieces next to the keel; and as fast as the blocks are removed and cleared out of the space between the sliding-ways, the bilge- and wale-shores are removed. When all the blocks are out, the plank, or trip, which is the forward end, is all that holds the ship from sliding.

The word is now given to "cut away," and the men have hardly cut off the plank, inch by inch, before the whole mass starts for its native element, amid the cheers of those who may be in attendance.—*S. H. Pook, Naval Constructor U.S.N.*

Ship, Log-. The log-chip. See Log.

Ship-lord. An old term for the owner of a ship.

Shipman. An old term for a mariner.

Shipman's Card. An old name for the compass.

Ship-master. The captain, master, or owner of a merchant ship.

Shipmate. A fellow-sailor. One who serves on board the same ship.

Ship-money. Money exacted illegally by Charles I. of England to fit out ships in time of peace.

Ship-owner. One who owns ships.

Ship-pendulum. A pendulum to show by its oscillations the roll and pitching motion of the ship.

Shipper. One who embarks freight in a ship.

Shipping. Vessels generally. The whole body of ships in a place.

Shipping-articles. Articles of agreement between the master and seamen with regard to wages, length of time of service, etc.

Shipping-master. A person legally appointed to superintend the shipping of seamen for the merchant service.

Ship-rigged. Rigged like a ship, with three masts, all provided with yards, and spreading square-sails.

Ship's Boats. The boats belonging to the ship.

Ship's Books. The books of the executive and of the paymaster, in which the names of the men are borne.

Ship's Company. The crew of the ship.

Ship's Cook. See Cook.

Ship's Corporal. A petty officer, whose duty is to assist the master-at-arms in preserving order, arresting offenders, etc.

Ship's Days. The lay-days allowed to a ship for loading or unloading cargo.

Ship-shape. In a seaman-like manner. Neat and thoroughly done.

Ship's Husband. The agent or broker who manages her accounts with regard to repairs, etc., while refitting.

Ship-sloop (*Eng.*). A sloop rated as a ship, because commanded by a captain.

Ship-star. An old name for the *pole-star*.

Ship's Writer. A petty officer who, under the directions of the executive-officer, does the

writing and keeps the watch-, muster-, conduct-, and other books of the ship.

SHIP-TIMBER. Timber to be used for ship-building.

SHIP-WORM. A mollusk, of the genus *Teredo*, that burrows in timber, secreting a calcareous shell as it goes, and weakening the wood.

SHIPWRECK. The destruction of a ship by being cast ashore on shoals or rocks; a ship that has been wrecked. See WRECK.

SHIPWRIGHT. A builder of ships.

SHIP-YARD. A dock-yard; a yard where ships are built or repaired.

Shiver. A sheave. *To shiver a sail*, to luff the ship, or brace the yard, so that the wind, acting on the edge of the sail, causes it to shake.

Shoal. A school of fish. A shallow or bar where the water is not deep. To become more shallow.

SHOAL-INDICATOR. A buoy placed on a shoal.

SHOALED-HARBOR. A harbor secured from the violence of the sea by banks, bars, etc.

Shock, William H., Chief Engineer U.S.N. Chief of Bureau of Steam Engineering. Born in Maryland. Appointed from Maryland, January 18, 1845; entered the naval service as third assistant engineer, during the Mexican war, served on board the steamers "General Taylor," "Princeton," "Spitfire," and the frigate "Mississippi," in which vessels, at different periods, he participated in the capture of Tampico, under Commodore Connor, and Alvarado, Tuspan, Tlacotalpan, and Vera Cruz, under Commodore Perry.

Promoted to second assistant engineer, July 10, 1847; ordered to the steamer "Engineer," Home Squadron.

Promoted to first assistant engineer, October 31, 1848; 1849, was senior engineer steamer "Legaré," coast survey; 1850–51, special duty at Philadelphia, superintending construction of machinery of steam-frigate "Susquehanna."

Promoted to chief engineer, March, 1851; 1851–52, special duty, Boston, Mass., superintending construction of machinery of steamer "Princeton"; 1853–54, inspecting engineer of ocean steamers for U. S. mail service, and chief engineer of steamer "Princeton," Home Squadron; 1854–55, West Point, superintending construction of machinery for steam-frigate "Merrimac"; 1855–56, chief engineer steam-frigate "Merrimac," Home Squadron; 1857–60, chief engineer steam-frigate "Powhatan," East India Squadron; 1860–62, president of Examining Board of Engineers; 1862–63, special duty at St. Louis, superintending construction of river monitors; 1863–65, fleet-engineer, West Gulf Squadron, participating in the capture of Forts Gaines and Morgan, under Admiral Farragut, and the Spanish Fort and city of Mobile, under Admiral Thatcher; 1865–66, chief engineer of Boston Navy-Yard; 1867–68, chief engineer of Washington Navy-Yard; 1868–69, fleet-engineer of European Squadron; 1869–70, inspector of machinery afloat, and member of Board of Visitors to Naval Academy at Annapolis, Md.; in the summer of 1870 was appointed acting chief of Bureau of Steam Engineering, retiring from the office with the written thanks of the Department for the efficient manner in which the duties of the bureau were discharged; in 1871 was again called to take temporary charge of the Bureau of Steam Engineering, and on retiring from the position was actively employed on other duty in the United States until 1873, when he was ordered to Europe on a tour of inspection of public and private dock-yards, and to represent the Bureau of Steam Engineering at the International Exhibition at Vienna, and by direction of the President was appointed one of the American Judges of Awards; returning from Europe, was detailed to other duty until March 3, 1877, when he was appointed and confirmed engineer-in-chief of the U. S. navy.

Shod. An anchor is *shod* when the fluke is covered with mud that has adhered to it.

Shoe. An iron arming to a hand-spike. A board hollowed slightly, and placed under a sheer-leg, to serve in transporting it. The outer piece of the forefoot. A flat block of hard wood, hollowed to receive the ear of an anchor-fluke. It slides up and down the bows, with the inner fluke resting in it, so as to prevent the anchor from tearing a hole in the bow. A triangular plank structure placed over the fluke to increase its area. *Magazine shoes* are of canvas, to be worn in the magazine. *To shoe an anchor*, to place over the palms projecting pieces of hard wood, secured by hoops and nails, so as to give greater holding-power in soft mud.

Shoe-block. A block consisting of a single piece of wood, without a strap, with two sheaves inserted at right angles to each other. They are used for main-buntline blocks.

Shoë-paun-dogee. A gorgeous imperia. yacht used by the emperor of Burmah on ceremonial occasions. It has a very high curved stern, a griffin terminates the bow, and a richly-gilded house is built on the deck.

Sholes. Pieces of oak placed under the soles of the shores while the ship is building; they are used to increase the surface under the shore so as to prevent its sinking into soft ground.

Shoot. To move rapidly; as, a ship "shoots ahead," etc. To pass rapidly through or by; as, to shoot a rapids, or a bridge. *To shoot a net*, to run it out into the water. *To shoot the sun*, to take its altitude. *To shoot the compass*, to go wide of the mark.

Shore. The littoral of a country. That part near the ocean. *Bold shore*, a high, steep shore. *Flat shore*, a low, flat coast. *Shelving shore*, a gradually descending coast.

A prop to support anything from below. *Bilge-shore*, a shore under the bilge. *Cap-shore*, a short support under the mast-cap. (See CAP-SHORE.) *Breast-shore*, a shore near the middle of the ship, extending abeam. *Wale-shores*, shores supporting the ship at the wales, extending vertically downwards. *To shore up a ship*, to place shores under a ship's bottom.

SHORE-ANCHOR. The anchor lying toward the shore.

SHORE-BOAT. A private boat belonging ashore.

SHORE-CLEATS. Heavy cleats nailed to the side of a ship, against which shores rest.

SHORE-DUTY. Service on shore, as distinguished from service afloat. Duty at navy-yards, Navy Department, etc.

SHORE-FAST. A hawser or chain securing a ship to the shore.

SHORE-PAY. The pay of an officer when on shore-duty. In the U. S. navy it varies from six- to eight-tenths of the highest pay.

SHORE-REEF. A fringing-reef.

SHORE-STATION. A naval establishment on shore.

Short. *To heave short*, to heave in on the cable until it is nearly up and down, or until the anchor just holds, without any slack cable. *Short-apeek*, up and down, applied to the cable of an anchor. *Short allowance*, a reduction of provisions, water, etc., in case of necessity. *Short board*, a short run on one tack, when circumstances preclude the use of longer intervals between tacks. *Short glass*, the 14-second glass, used with the log. *Short-handed*, deficient in men. *Short-linked chain*, chain without studs, and with short links. *Short sea*, a confused, tumbling sea. *Short-service*, service placed on a hemp cable for riding at a short stay. *Short stay*, that position of the cable when it is nearly up and down, or when the anchor is nearly atrip.

SHORTEN. To *shorten in* on the cable is to heave in to a shorter scope. *To shorten sail* is to reduce the amount of sail by taking in some of them; to haul up or take in all sail when set or loosed to dry.

SHORT-SHEET. The shorter of the two sheets fitted to a topmast stun'sail. When the sail is set, it is led through a thimble on the lower yard into the top, where it is belayed.

SHORT-SPLICE. A short union of two ropes, used when an increase of the diameter is not inadmissible.

Shot. The union of two or more cables, for greater length, form a *shot* of cable. The reckoning or expense. A place where fishermen draw their nets. The sternmost part of a fishing-boat. A kind of trout. To load a gun with shot. See PROJECTILES.

SHOT-GARLAND. See GARLAND.

SHOT-GAUGE. A gauge or calliper to measure the dimensions of shot.

SHOT, GRAPNEL-. A shot with a grapnel attached, carrying a line, to be used in communicating with ships in distress.

SHOT-LOCKER. A strongly-built locker in the hold, to contain shot. *Shot in the locker*, money in the purse.

SHOT-PILE. A pile of shot in a navy-yard or magazine on shore. Shot are carefully piled on masonry or wooden platforms. The number of shot in a pile is found by multiplying the sum of the three parallel edges by the number of balls in a triangular face.

SHOT-PLUG. A wooden plug used in connection with fearnaught for stopping shot-holes.

SHOT-PROP. A wooden prop covered with tarred hemp, used to stop a shot-hole from the inside.

SHOT-RACK. Iron rods fitted about the hatches, water-ways, and on the berth-deck, to contain shot.

SHOT-TROUGH. Wooden troughs placed about the decks to convey shot during action.

SHOT-WAD. A wad of hay or junk placed in front of a shot to hold it in place in the bore.

SHOT-WHIP. A whip for hoisting shot from the locker.

Shotten Herring. Cleaned herring for drying. A lean, lazy fellow.

Shoulder. The projecting portion of a ship about the water-line, that gives her stability under canvas. A ship it said to *shoulder the anchor* when she drags it in consequence of having too little cable out.

Shoulder-block. A block with a shoulder or square projection at the upper end, to keep it in an upright position.

Shoulder-knot. An ornamental knot of gold lace, worn on the shoulder in lieu of strap and epaulet. Officers of the grades of ensign and midshipman, and corresponding grades in the staff corps, and company officers of the marine corps, wear shoulder-knots.

Shoulder-of-mutton Sail. A triangular sail attached to a mast, and used in boats.

Shoulder-strap. A narrow strap of cloth worn on the shoulders by all commissioned officers above ensign in the navy, and assimilated ranks, and all field-officers in the marine corps. In the strap distinguishing ornaments are worn, as follows: all line-officers, an anchor in the centre or at each end; master, one gold bar at each end; lieutenant, two gold bars; lieutenant-commander, one gold leaf at each end; commander, one silver leaf; captain, silver eagle in the centre; commodore, one star in the centre; rear-admiral, one star at each end; vice-admiral, three stars; admiral, four stars. Officers of the staff corps substitute for the anchor: medical officers, a blank; pay-officers, an oak sprig; engineer officers, four oak leaves in a cross; naval constructors, two oak leaves and an acorn in gold; chaplains, a silver cross; professors, one oak leaf and an acorn; secretaries, the letter S in silver. See UNIFORM.

Shout (*Eng.*). A light flat-bottomed ducking-punt.

Shoveler. A duck (*Anas clypeata*), with a broad bill.

Show Leg! "Turn out quickly." An expression used to get the watch out of their hammocks.

Shrab. A Calcutta drink.

Shrapnel. A species of shell, devised by Gen. Shrapnel, also called spherical case. They are thin shell, being one-tenth of their diameter in thickness. They contain a bursting charge of powder only sufficient to burst the shell, and a quantity of sulphur, in which a number of balls, from .65 inch to 1 inch in diameter, are imbedded. They are cast like shell. Their use is effective against boats or bodies of men, at considerable distances. They are boxed and have sabots like shell, but the boxes are painted white. Those for smooth-bore guns and howitzers have Bormann fuzes. They are not yet used in rifle-cannon in the U. S. navy. *English shrapnel*, also called *diaphragm-shrapnel*, have a thin iron partition separating the bullets from the bursting charge.

Shrimp. The *Crangon vulgaris*, a crustacean used for food.

Shroud. A rope belonging to the standing rigging of a ship, generally alluded to in the plural. Each shroud is connected with another so as to form a *pair*. They are made of shroud-laid tarred hemp rope, or more commonly now, of wire rope. A collar is formed by a seizing that embraces the mast-head. In the end of each leg of a pair is placed a dead-eye, or a rigging-thimble, or it embraces the upper part of a rigging-screw, as the case may be. It is fastened by laniard or screw to the chain-wales, and the shrouds, being set up, support the mast sideways. When there is an odd number of shrouds, the forward or after one is the odd one.

The forward shroud is called the *swifter*. Shrouds after being cut, when of rope, are wormed, parceled, and served where the eyes are formed, and swifters, all the length; when of wire, they are red-leaded, wormed, and parceled, again red-leaded and served full length. Shrouds are variously named from the spars they support.

SHROUD-BRIDLE. A bridle formerly placed in the shrouds, with a thimble in the bight, through which the lower sheets led.

SHROUD-CLEAT. A wooden or iron cleat, seized to a shroud, to belay a rope to.

SHROUD-KNOT. A knot formed in a shroud that has parted.

SHROUD-LAID ROPE. Right-handed four-stranded rope, with a heart.

SHROUD-PLATES. Iron plates extending from the dead-eyes to the ship's side.

SHROUD-ROPE. Superior rope for shrouds and stays, of the best Russian hemp.

SHROUD-STOPPER. A rigging-stopper. See STOPPER.

SHROUD-TRUCK. A fair-leader, or short wooden cylinder, having holes in it for rigging and a groove and score, the latter embracing the shroud, and the former filled by a seizing, fastening it to the shroud.

SHROUD-WARP. See WARP.

Shubrick, the name of several gallant officers of the U. S. navy, natives of South Carolina, sons of Col. Thomas Shubrick, aid to Gens. Greene and Lincoln in the Revolutionary war, born 1775; died at Charleston, S. C., March 4, 1810.

John Taylor, born September 12, 1788; died July, 1815; midshipman, June 20, 1806; lieutenant, May 28, 1812. He was in the "Chesapeake" in her affair with the "Leopard," in 1807; in the action of the "Constitution" with the "Guerriere," in August, and with the "Java," December 29, 1812; of the "Hornet" with the "Peacock," February 24, 1813 (for which he received medals from Congress); of the "President," when captured by a British squadron, in January, 1815, and on the conclusion of peace was dispatched to the United States in command of the "Epervier" with the treaty. This vessel was never afterward heard from.

William Branford, born October 31, 1790; midshipman, June 20, 1806; lieutenant, January 6, 1813; commander, March 28, 1820; captain, February 21, 1831; rear-admiral (retired list), July 16, 1862; commanded battery of one gun on Craney Island in the repulse of the British forces, June 22, 1813; lieutenant in the "Constitution" in action with the "Cyane" and "Levant," February 20, 1815; commanded squadron in the Pacific in 1847, and captured Mazatlan and other ports from the Mexicans; commanded Brazil Squadron and Paraguay Expedition, 1859; chairman Light-House Board, 1860–70.

Edward Rutledge died at sea, March 12, 1844, at about 50. Midshipman, January 16, 1809; lieutenant, October 9, 1813; commander, April 24, 1828; captain, February 9, 1837; served under Commodore Rodgers in the war of 1812–15; appointed to command the "Columbia," Brazil Squadron, May 4, 1842.

Irvine, born in 1797; died in Philadelphia, April 5, 1849. Midshipman, May 12, 1814; lieutenant, January 13, 1826; commander, September 8, 1841; served under Decatur in the action of the "President" with the British squadron in 1815; also in the war with Algiers in 1816; as first lieutenant of the "Potomac," in 1832, headed the sailors and marines in the destruction of Quallah Battoo.

Shufeldt, Robert W., Commodore U.S.N. Born in New York. Appointed midshipman from New York, May 11, 1839; first cruise in the frigate "United States," Pacific Squadron, 1839–41; in brig "Bainbridge," Home Squadron, 1842–44; at Naval School, Philadelphia, 1844–45.

Promoted to passed midshipman, July 2, 1845; on the coast survey in 1845–46; in frigate "United States," Mediterranean Squadron, 1846–47, and sloop "Marion," same squadron, 1847–48; in mail-steamer "Atlantic," 1849–50.

Promoted to master, February 21, 1853.

Commissioned as lieutenant, 1854; resigned, June 20, 1854. (While out of the navy he was active in the organization of the steam commercial marine of New York. Served two years in the Collins line of Liverpool steamers, as chief officer; superintended the building of and commanded the steamers "Black Warrior" and "Cahawba," between New York and New Orleans; was engaged for a year in the effort to open a transit across the Isthmus of Tehuantepec. At the commencement of the war, was commanding the steamer "Quaker City," between New York and Havana, when he was appointed consul-general to Cuba by President Lincoln; served in that office for two years, under difficult and trying circumstances, with the entire approbation of the government. He resigned in April, 1863, and accepted a commission of commander in the navy, previously tendered.)

Reinstated and received commission as commander, dated November 19, 1862. In May, 1863, commanded steamer "Conemaugh," South Atlantic Blockading Squadron; was present and participated in the capture of Morris Island, and in several of the attacks upon Fort Wagner; commanding steamer "Boteus," East Gulf Blockading Squadron, 1863–65; commanding steam-sloop "Hartford," flag-ship East India Squadron, 1865–66; commanding steam-sloop "Wachusett," Asiatic Squadron, 1866–68; commanding naval rendezvous, New York, 1868–69.

Commissioned as captain, December 31, 1869; commanding monitor "Miantonomah," 1870; commanding Tehuantepec and Nicaragua Surveying Expedition, 1870–71; commanding "Wabash," flag-ship European Squadron, 1871–72; navy-yard, New York, 1872–74; chief of Bureau Equipment and Recruiting, 1875–78; commanding "Ticonderoga," special service, 1879–80.

Commissioned as commodore, September 21, 1876.

Shurgnee. A damp southeast wind in the Persian Gulf, preceded by heavy dews.

Sick-bay. This term is used for the hospital in the navies of English-speaking people. We understand by it a separate apartment, wherever situated, on board ship, for the reception and treatment of the sick and wounded.

Few single-decked vessels in our navy have any sick-bay, or hospital, at all, the sick being slung up to the beams, in their hammocks, or cots, anywhere about the berth-deck where they will be most out of the way. During the day they unavoidably suffer from noise, constant col-

lision with their swinging-beds, and the heat and odors of cooking from the galley. At night every inch of the space about them is occupied; the air is mephitic, and, when the watch is relieved, the noise and jostling of hammocks recurs. To reach a sick man in his "billet," the medical officer, or apothecary, or nurse must frequently pass under other hammocks, disturbing those well men who need their rest, or other invalids.

All frigate-built ships, and some corvettes or sloops-of-war, have sick-bays, and almost invariably these have been placed on the lowest inhabited deck, and in the extreme forward end of the vessel,—about the worst possible place for sick men.

The chief requisites for a hospital, or receptacle for sick and wounded, either ashore or afloat, are, in addition to proper shelter from the weather, the best attainable quietude, ventilation, and natural light.

These requisites have been systematically ignored in our navy, and, until quite recent times, in most other navies. In most of the latter more enlightened views now prevail, however, the French having led the advance. This being the case, it is altogether possible that our navy will, in due time, and in types of vessels permitting it, follow an excellent example, and remove the hospital from the berth-deck.

The usual position of the "sick-bay" (said to be so called because it made people sick) appears to be a traditional arrangement, derived from the galley period, through the French, and thence to us through the English, who derived many of their ideas in naval architecture from study of the vessels captured from their neighbors across the Channel.

Henry Teonge, a chaplain in the British royal navy more than two centuries ago, who kept a very minute diary, makes particular mention of sickness and mortality on board three large frigates, and yet never hints at the existence of any sick-bay or hospital. It is, therefore, to be supposed that there was no place set apart for the purpose in the English navy at that time.

Fonssagrives—one of the best authorities upon the subject—says that from all time the forward part of the ship seems to have been devoted to the sick, and that it was so devoted when rude manners and ideas saw in the sick only useless encumbrances, and when *væ ægrotantibus* seemed as natural as the *væ victis* of the ancients.

These quarters were given to the sick, then, not as the most suitable for them, but with a view to isolate them, and thus to preserve the rest of the ship's company from contagion,—often of plague, or of ship fever,—putting them somewhere where well men would not be obliged to touch them, or pass them. The only other place where these conditions could obtain—the stern of the vessel—was already occupied by the commanding officer.

Jean Marteilhé, of Bergerac, tells us that in the French royal galleys of the 17th and 18th centuries, the compartment in the bows, under the low deck of the galley's prow, beneath the water-line, close, dark, and dismal, served for the combined purpose of stowing the cables and the medicine-chest, and here, upon the cables, were piled the sick,—if they were allowed to leave the oar at all,—as well as those wounded in battle; so that great mortality ensued. "The wounded died like flies," he says.

M. Jal also alludes to the hospitals of fighting-galleys, of an earlier period, which he says were in the forward part of the vessel, and called, at that time, "tollar," from *tolerare*, to suffer. "It was there the sick suffered."

Smollett, writing of the Carthagena Expedition, 1741, says that the hospital of the man-of-war in which he served was three degrees more offensive and more suffocating than the cock-pit,—then, and long after, the quarters of the surgeon's mates, as has been the case in our navy within twenty years.

In the French navy of more modern times the traditional practice of placing the sick on the lower deck, forward, seems to have been first broken in upon about the year 1810, when strong remonstrances against its impropriety and impolicy—cruelty, indeed—caused important changes to be inaugurated, and these have been permanent.

It is, however, within quite recent times that the sick-bay has been taken from the berth-deck, in double-decked vessels of the English navy, and it never has been done in the U. S. navy, except in some receiving-ships, which are not in any sense sea-going vessels.

As a precaution and temporary measure, in cholera, yellow fever, and other epidemics, or in case the wounded were so numerous as to overflow the limits of the "sick-bay," they have been placed upon the gun-deck or elsewhere. Still, with us, the old sick-bay, in the most dismal part of the ship, is the only recognized official hospital on board. The usual position of our "sick-bay" is objectionable for many reasons. Ventilation is bad, at the very best. Light is defective in the extreme. The air-ports, of which there are seldom more than two, of a few inches diameter, are seldom open, except in a calm, or in a close harbor. As a rule, candles are used to examine patients, and even to perform important operations. Ether must be used with care in artificial light, otherwise there is danger to the ship and all on board.

The chains are worked just above the sick-bay. The ship's bell is generally so hung that its jarring tones are more distinctly heard in the sick-bay than anywhere else. The chatter and noise of the berth-deck cooks, and the smell of onions, garlic, and other ingredients of nautical "scouses," is generally more perceptible in the sick bay than anywhere else.

Since the abolition of flogging prisons have become more necessary, and these are now generally built against the after part of the sick-bay. Sometimes they encroach upon its scanty air-space. Here drunken, noisy men are apt at times to be confined. There is also unavoidable damp and leakage, from the working of the head; the water often trickling down the breast-hooks, or filtering down from the gun-deck, after seas are shipped into the manger, through the hawse-pipes.

At sea, or even at anchor in roadsteads and other exposed places, with fresh winds and rough water, the monotonous, pile-driving blows of the sea against the bows are almost sufficient to distract a well man, let alone a patient in hospital.

Our merchant vessels long ago removed their crews from the holes called forecastles, which

answered, in most respects, to the usual position of our sick-bay.

Serious attention has been given to this important matter by many of the naval medical officers, who have made frequent and urgent reports upon the subject, especially Medical Director A. L. Gihon; while Admiral Leroy, Admiral Porter, and Commodore Shufeldt have officially recommended a change. Their exertions in this direction are worthy of all praise, and may, eventually, be successful in accomplishing a reform called for by considerations both of humanity and expediency.

With a *personnel* crowded in the extreme, far beyond all sanitary limits, there is, on the berth-deck of a man-of-war, a permanently contaminated atmosphere which is never very much improved during a cruise, from the impossibility of evacuating and thoroughly cleansing the deck, even in the daytime. Even if evacuation could be accomplished, the means of thoroughly renewing the air is practically, in most cases, nearly wanting.

The air-ports do not accomplish it, nor do wind-sails, and, in some cases, patent apparatus has done more harm than good, while other apparatus have been rejected on account of the expense, as if any cost could be too great for machinery which accomplished this all-important purpose. Army and navy men, and many in civil life, are continually grappling with the difficult question of the disposition of the emanations from healthy human bodies alone, and the question has not been solved. Should we, then, expose the sick to these emanations, or the well to those of the sick? Would any one who could live elsewhere live in a damp and unventilated back cellar? And yet this is about the relative position of the sick-bay in our men-of-war, where the sick and wounded are not afforded the best chance of recovery.

As has been stated, the sick-bays in the French and English navies are now generally upon the gun-deck; either arranged with movable, latticed bulk-heads and placed amidships, or on each side, taking in about two gun-ports, the guns being slewed round, and lashed against the side, but not removed. In case of action they are readily brought into service, and their crews are exercised at other guns. A favorite way in the French navy was to have the sick-bay forward upon the gun-deck, bulk-headed with latticed windows, and embracing the bridle-ports, which, being mostly kept open,—even at sea in fair weather,—were a fine source of light and air.

They had, generally, glass windows for these ports: to be used in cool weather. Here was light, ventilation, and cheerfulness secured. The chains, in this case, were worked by oblique hawse-pipes underneath the sick-bay.

(Nothing would be interfered with but the traditional chicken-coops and live-stock in the manger, which pollute our gun-decks yet.)

In our navy the *personnel* of the sick-bay, besides the medical officers in charge, are the apothecary, whose dispensary, in double-deck ships, is often 100 feet or more from the sick-bay, while the medical store-room is elsewhere, either in the darkest part of the cock-pit, or in the shaft-alley, probably to the great detriment of stores and medicaments which, upon a sudden emergency, may be of the highest value, and exposed, more or less, to pilfering.

The apothecary is fairly paid, and ranks as a petty officer.

The attendants upon the sick are now called "nurses" and "bay-men." They are generally selected from the crew, paid as landsmen, and usually without any experience, either in nursing or cooking. The apothecary, nurses, and bay-men are selected by the senior medical officer. In the case of the apothecary, he is appointed, under certain regulations, with the approval of the commanding officer. The nurses and bay-men may be appointed in the same way, but this is generally not the case, they being picked up from among the landsmen.

On board ship men whose sickness is slight are only put upon the "binnacle list." In well-regulated sick-bays they are not allowed to take up the limited air-space by spending their time there, except while being prescribed for or receiving medicine.

More serious cases are put upon the "sick list," and generally allowed to have their hammocks down in the daytime, should the medical officer consider it necessary. Important cases of illness, or surgical cases of gravity, have cots slung for them, which afford a very fair degree of comfort. Standing beds, of iron, swung to upright posts, with gimbals, have been used, in some cases with approval, in our sick-bays. Fleet-Surgeon Foltz, who served in the operations under Farragut in the "Hartford," always spoke most highly of them. But there are serious objections to their use, not necessary to be entered upon here, in the confined space at present allotted to the sick-bays.—*E. Shippen.*

Sick-berth. A place temporarily screened off to accommodate sick men.

Sick-book (*Eng.*). An account of sick persons on board, or sent to the hospital.

Sick-flag. The yellow quarantine-flag. In the English service there are two other sick-flags, one yellow with a black ball, the other with a square in the centre, used to denote the presence of contagious diseases.

Sick-leave. Leave of absence given on a surgeon's certificate of disability, or on medical survey.

Sick-list. The list of sick, with their complaints and condition, sent in daily to the commanding officer by the surgeon. A duplicate list of names only, posted on the upper deck, is called the *binnacle-list.*

Sick-mess. The mess for the sick, partly provided by the surgeon's department.

Sick-ticket. A paper which is sent with a patient to a hospital, giving rank, description, disease, etc.

Side. The side of the ship includes all the outside upper works from the gunwale down to the main-wales, where the bottom commences.

Side-boys. Boys detailed to attend at the gangway, on the approach of officers, dignitaries, etc. By the regulations of the navy, side-boys may be called as follows: for admiral and vice-admiral, 8; rear-admiral or commodore, 6; captain and commander, 4; all other officers, 2. This time-honored custom is gradually falling into disuse.

Side-cleaners. Men detailed to keep the side clean, sweep out channels, etc. These are

chosen from each part of the ship in rotation, and clean their own parts.

Side Counter-timber. The stern-timber resting on the wing-transom, and extending to the upper rail.

Side-curtains. The awning curtains.

Side-ladder, or Accommodation-ladder. A staircase fitted to ship and unship, used at the gangways on the outside of large ships. On steamers it is usually a short ladder, tricing up at the lower end when not in use.

Side-lights. Lanterns used at the gangway at night. The *running lights* placed on either side of the ship, green and red in color.

Side out for a Bend (*Eng.*). In coiling a cable, to draw outside the last turn, to begin a new sheave, or tier.

Side-screens. Screens of canvas placed about the side-ladder.

Side-steps. Pieces of wood bolted to the ship's side at the gangway, serving as steps to ascend the side.

Side-stops. Stops fastened to the side-ropes of an awning, to spread it to the ridge-rope.

Side-wind. A wind from one side, so that the ship may lay her course, but the yards are braced in more or less. A wind blowing from one point forward to three points abaft the beam.

Side-beam Engine, or Side-lever Engine. A form of marine steam-engine in which the motion is transmitted from the piston-rod cross-head by *side-rods* passing downward on each side of a vertical cylinder to a pair of *beams* or *levers* working at the sides of the bed-plate near the bottom of the vessel, and from thence, through the cross-tail and connecting-rod, upwards to the crank. The object of the arrangement is to secure conciseness and enable the engine to be placed low in the vessel and well protected below-decks. It is used for paddle-wheels only. The form is nearly obsolete.

Sidereal (Lat. *sideralis*, from *sidus*, *sideris*, a star). Pertaining to the stars. See Day, Time, Year.

Side-keels. Keels on either side of the centre line of the ship's bottom. Used in small vessels, to give greater stiffness to them.

Side-keelsons. Sister, or side-keelsons, are additional to the main keelson, and are used especially in light-draft vessels to add to the stiffness of the main keelson, when it has not sufficient depth.

Side-lever. One of the *beams* of a side-lever engine. A lever working at the side of any machine.

Side-rod. One of the rods connecting the cross-head of a steam-engine to a side-lever. In back-acting screw-propeller engines having a single piston-rod, the rods or bars connecting the piston-rod cross-head with the connecting-rod cross-head are called *side-rods*.

Side-sights. Sights for a cannon placed at the side of the breech, and on the trunnion.

Side-tackle. A luff-tackle on either side of a broadside gun-carriage, having the inner-block hooked to an eye-bolt in the carriage, and the outer-block to the *fighting-bolt* or to the *securing-bolt* in the ship's side.

Side-tackle Block. These blocks are now made of gun-metal, with a *nib*, or half-hook, cast on them.

Side-tackle Bolt. The eye-bolt in the gun-carriage, to which the side-tackle hooks.

Siding. The breadth of a piece of a timber. Making two sides of a timber parallel.

Sight. An observation of the altitude or other angular distance of a heavenly body. A piece of metal fixed on a fire-arm for the purpose of directing the fire of the gun. The *breech-sight* is that placed at the breech of the gun, on which are marked the degrees of elevation and the distance corresponding to such elevation attained by the shot. The *front-sight* is a small wedge, placed farther towards the muzzle of the gun, which is so brought in line with the bottom of the notch in the breech-sight, and the object, that a straight line is formed by the line of sight. Sometimes this sight is on the muzzle; at others it becomes a *reinforce-sight*, when it is placed at or near the reinforce of the gun. *Side-sights* have been described above, and then the front-sight is a *trunnion-sight*, placed on the trunnion of the gun. *Tangent-sight*, see Tangent. *Dispart-sight*, see Dispart. Rifle-sights have a small side piece, allowing for the *drift* of the projectile. The fitting and adjusting of the sights of a gun is an operation requiring great care and precision. *Leaf-sights* are those on small-arms, where a movable leaf or hinge is raised, to obtain long ranges. *To sight*, to see, as *to sight land*. *To sight the anchor*, to heave it up to see if it is clear.

Sight-bar. A metal bar on which the range in yards, or in degrees, is marked. It is a part of the breech-sight, and, by raising or lowering it, different ranges are obtained.

Sight-cover. A metal cover, placed over the sight of a gun, to protect it from injury when not in use.

Sight-mass. A casting, or projection on the gun, on which the sights are placed.

Sight, Telescopic. Sights with telescopes attached, to magnify the object at great distances.

Sight-vane. See Vane.

Signals, Marine. Marine signals are certain signs agreed upon for suddenly communicating intelligence to distant objects at sea, to which the voice cannot possibly reach. The necessity for the establishment of a code of communication by means of fixed signs must have been made evident and have been provided for simultaneously with the first formation of a fleet for united action. It is well known that signals were made in the early Greek and Persian fleets by means of the sails, certain meanings being attached to the partial loosing of one or more. The exhibition of shields in prominent positions and flaming fires were also modes of communication. As the early naval tactics, however, comprised but few manœuvres, no full description of any single code of signals is to be found in ancient writings. Marine signal systems are properly divided into three main categories,—Day signals, Night signals, and Fog signals, and these branches will be treated of separately in considering the developments of the science.

Day Signals.—Of the systems coming under this head those involving the use of flags are the most important. That flag signals were in use as early as the 13th century is evidenced by one of the articles of the Laws of Oleron, by which it is prescribed that a vessel desiring a tow or a

pilot shall hoist her ensign. As early as the first part of the 17th century an approach to a regular flag code is noted, in which flags, pennants, and banners were used.

Papal Code (1614).—In the papal fleet instructions it is prescribed that: A pennant hoisted on the poop indicates "make sail," and it is to be dipped once for each sail to be set. A pennant from the mast-head look-out indicates a strange sail in sight; it is to be dipped once for each sail seen. A pennant from the yard-arm indicates that "wine is being served out to the crew." A square flag at the same place, "bread is being served out"; and both signals together, "bread and wine." A banner held up by a man standing amidships indicates "distress." A banner held up on the poop indicates "form line ahead." From these examples it is seen that both tactical and general signals were in use, and that a distinction of color in the flags was made at that day is evidenced by a fragment of fleet instructions issued as early as 1420 by the Venetian Capt.-Gen. Piero Mozenigo, in which it is stated that each galley of the fleet shall have a ship's signal, or, as it would now be called, a number, consisting of a pennant and a flag, which when hoisted should indicate that the admiral desired to communicate with such vessel. Although fleet signals were thus used, they appear to have been upon no fixed principles previous to the middle of the 17th century.

Duke of York's Code (1665).—To King James the Second of England, when, as Duke of York, he commanded the English fleet in the Dutch war of 1665, belongs the honor of first establishing a signal code upon a regular system. Exactly what this code was is not known, but it is surmised that it was based upon naming flags for the letters of the alphabet. It would seem scarcely probable that signals were spelled out by this means, as the majority of the commanders in his fleet in all probability were unable to read; but it is certain that his fleet instructions comprehended a long list of tactical and general signals based upon a regular system. By the middle of the 18th century this system had been developed to the extent that throughout the English fleet a code system was in use in which 30 flags were used, 1 for each letter of the alphabet and 4 auxiliary flags. This system was, however, quite complex, as different meanings were given to combinations when hoisted in different places.

Lord Howe's Code (1792).—In 1781 a Mr. McArthur, who had been secretary to Admiral Lord Hood on the American station, devised an improved code, which was introduced into the British service as Lord Howe's Code in 1792. In this code the number of flags was reduced to 13, and pennants were abolished. In the make-up of the flags 4 colors were used, Red, Blue, Yellow, and White,—there being but 2 colors in each flag. Each flag was known by a number from 1 to 12, and also by a letter. In designating the letters a very shrewd system was introduced. The flags were made as follows: In 3 the colors were horizontal; in 3 perpendicular; in 3 diagonal; in 3 double diagonal, and the 13th, called the "substitute" flag, was blue with a square white centre (the present blue peter). The flags taken in regular succession were called from the first 12 letters of the alphabet. For the next 12 they were inverted, or where inversion would make no change the *other color* was placed next to the mast. The last two letters were made with two flags. In this manner an alphabetical code was established, while for the numbered code, by means of the inversion and the substitute flag, 20,000 signals were made with not more than 4 flags in a hoist. It was by means of this system that the famous Trafalgar signal was made,—"England expects every man to do his duty." In this code also appears for the first time a division of the signal book into subjects,—Anchoring, Calling Officers, Chasing, Convoy, Fighting Instructions, Sailing Evolutions, Private Signals, and Miscellaneous.

United States Code (1795).—The early United States Code was almost precisely similar to the English development of King James's Code. There were 26 flags, one for each letter, and a number of pennants for special and defining signals. There was no fixed code dictionary, but beyond a few general signals each squadron commander made up his own combination. This continued until about 1816, when a code dictionary was issued, in which, however, no regular method was followed out. About 1826 the British Admiralty altered their system to a 10-flag code, introducing pennants again for defining the various meanings of certain combinations.

Rogers's American Code (1846).—The United States Navy Department adopted a code in 1846 devised by Henry J. Rogers, superintendent of telegraphs. In this code there were 9 square flags and 5 pennants. The flags were numbered from 1 to 9. One pennant was 0, or hoisted singly was the alphabetical signal. The next 3 were repeaters, and when hoisted singly were respectively, Answering, Yes and No. The fifth pennant was the "Numeral." The first 9 letters of the alphabet were made with the single flag, the next 9 by a square flag with a pennant under, and the last 8 by the square flag with the pennant over. The signals in the dictionary were numbered in regular order up to 13,405, the book being divided into 14 headings. In this system a pilot code was introduced for use in piloting ships into harbor or out when circumstances would forbid boarding. These were made by means of the union-jack hoisted in conjunction with one or more signals.

United States Code (1861).—Rogers's Code was modified in 1861 to a system having 12 square flags and 9 pennants; there being 10 numbered flags, 3 repeating pennants, and 2 square and 6 pennants as defining signals. The dictionary was reduced to contain 9999 signals. Thus this system was an elaboration rather than a modification of previous systems. In 1866 this system was still further elaborated by the addition of some 6 or 8 defining flags and pennants. At the same time the signal book was remodeled. Tactical signals were separated from the general signal book, and the latter was arranged according to the customary method,—Alphabetical, Compass, Word, Geographical, and General.

International Code (1856).—The British government devised a code for international use in 1856, which by 1871 had been adopted throughout the world with the single exception of the U. S. merchant marine. This code is made up of 1 burgee, or swallow-tailed flag, 13 square flags, and 5 pennants. Eighteen of these flags and pennants represent the 18 consonants of the al-

phabet, the nineteenth color being a pennant for answering and defining. In this code appears an arrangement that may well be called the perfection of principle. The signal book is divided into different topical headings, and it is the designation of these headings by which they may be known at great distances or in calms that constitute the excellence of the principle. The designations are as follows:

Two-flag signals having the burgee uppermost are attention signals.

Two-flag signals having a pennant uppermost are compass signals.

Two-flag signals having a square flag uppermost are urgent signals.

Three-flag signals are all general in character.

Four-flag signals having the burgee uppermost are geographical signals.

Four-flag signals having a pennant uppermost are spelling signals or names of men-of-war.

Four-flag signals having the square flag uppermost are names of merchant vessels.

This principle has been adopted in all naval codes except that of the United States, which at present is the most cumbersome extant.

Tide Signals.—At many ports where the rise and fall of the tide is very great, flag signals are used at some elevated shore-station to denote the depth of water in the channel at different tidal intervals. At these stations signals are also provided by which a ship may be directed in her course up the channel when circumstances forbid her being boarded by a pilot.

Storm Signals.—A system has been introduced along the coast of the United States, and is rapidly being extended to European coasts, by which the approach of a storm and the direction from which the wind will blow is signaled to departing or approaching vessels.

Distant Signals.—Under many circumstances it becomes impossible to communicate by means of flags during the day, and to obviate this difficulty a system of distant signals is introduced into the International Code. This system consists in substituting shapes to designate letters in place of flags; the objects chosen are a ball, a pennant, and a square flag, or objects which would approach these shapes, such as a bucket, an oar, and a shirt. Eighteen different combinations of these objects give the 18 consonants of the code. The same idea is carried out at shore-stations.

Semaphoric Signals.—At coast telegraph-stations semaphores are put up for communicating with vessels. These semaphores consist of a long staff having hinged at its top a disk, and down its length 3 long slats. The disk at horizontal means Answering, at vertical, International Code. A slat pointing angularly downward represents a pennant, horizontal, a ball, and angularly upward, a square flag. Thus any 3-flag signal (all such being general) may be made at one motion.

Night Signals.—The use of night signals probably originated about the same time as day codes; as previously noted, the ancients used signal-fires, and in Mozenigo's fleet instructions we find them provided for.

Mozenigo's Code (1420).—A fire exhibited on the poop shall signify "set the mainsail," 2 fires, "both the square-sails," 3 fires, "all plain sail," 4 fires, "lay in the oars and make all sail." In the papal prescriptions is found a reference to running lights: "Division and squadron commanders shall carry 3 lanterns at night, other galleys 1 lantern."

King James's Code (1665).—Guns were used for night signals soon after their introduction in naval services. King James instituted a regular numbered code, which, although appearing comical at this day, shows how wisely the principles of signaling were laid down at that time. In this code guns, blue-lights, and lanterns were used. One gun was attention, or number 0. Then 1, 2, 3, and 4 were designated by the corresponding number of lanterns, 5 by 1 blue-light, 6, 1 blue-light and 1 lantern, and so on up to 10, which was 2 guns. There were only 40 signals in the code, but the numbers were unmistakable. Thus, 39 would be 4 guns, 1 blue-light and 4 lanterns. The signals were all urgent or tactical.

Kempenfeldt's Code (1792).—The King James Code was used until the adoption of Lord Howe's Day Code, in 1792, when a code of lantern signals, devised by Admiral Kempenfeldt, and perfected by Mr. McArthur, was adopted. This code did away with guns and blue-lights, using only lanterns. Eight lanterns were used, divided into 2 groups; 4 were hoisted either at the starboard yard-arm or fore-gaff, and 4 at the port yard-arm or spanker-gaff, depending upon the position of the vessel signaled to. Each lantern was provided with a tin "obscurer," worked by tricing lines from deck, and numbers were signaled by means of the combinations of two or more lights shown. Whilst this system was used, the old gun and light method was retained for important fleet signals.

Rogers's Code (1846).—Colored lights were introduced for signal purposes in the first part of the present century, but the first regular pyrotechnical system was devised in the United States by Rogers. In this system, pyrotechnical composition was made up in small cylinders, colors corresponding with the day flags. By removing a small cap and igniting the composition with a slow-match, the colors burned in regular succession.

Coston's Code (1858).—The Rogers system was modified and improved in 1858, by Gunner Coston, of the U. S. navy. A more brilliant composition was introduced, and the signals were so made that they were held in the hand and ignited by percussion.

Very's Code (1877).—Lieut. Very introduced a code in 1877, in which a departure was made from Rogers's principle. The signals themselves were devised on the principle of a ball cartridge, single stars being shot into the air to a height of about 400 feet. The principle of the code approached closely that of a telegraphic system. Each digital number or letter of the alphabet is made by the same number of stars, so that in transmitting a signal no time interval is made between letters or figures. By a simple method of interjecting stars in the regular course of a signal, the desired message is so completely ciphered as to be entirely unintelligible to any except those understanding the cipher. In place of the 18 or 20 different pyrotechnical pieces used in the Rogers and Coston codes, but 2 are used, and only 2 colors, in place of the 3 of the earlier methods.

Rule of the Road Signals.—It has been stated

that running lights were used regularly as early as the 15th century, and probably they were used much earlier, but no change in the method of carrying a light at night appears to have been made from the earliest days down to 1846, when it was prescribed that steamers should carry 2 lights. In 1852 the rule for vessels to carry a red light on the port side, and a green light on the starboard side, was adopted. In 1861 steamers were ordered to carry a white mast-head light. In 1864 the international rules were promulgated, by which sailing-vessels, steamers, vessels in tow, and pilot vessels were made distinguishable by their lights. In 1880 these rules were revised, and additional lights were provided for vessels in distress, and for vessels engaged in different kinds of fishing.

Fog Signals.—The custom of blowing fish-horns to denote the position of a vessel in a fog is one several centuries old, but no regular rules for fog signals appear to have been made previous to about 1840, when the rule for sailing-vessels of blowing 1 blast when on the starboard tack, 2 on the port, and 3 when running free, was made. About this time the rule for steam-vessels to blow the whistle was established. In 1864 fog signals were incorporated in the Rules of the Road, the old rule for sailing-vessels being abolished, and in place of it a single signal of 1 blast introduced. All vessels at anchor in a fog struck the bell at short intervals, in place of sounding a horn or whistle. In 1868 a rule was adopted in United States waters by which, at all times, when a steam-vessel changed her course to avoid another, she blew 1 short blast if keeping to starboard, 2 if keeping to port, and 3 if backing. In 1880 the new Rules of the Road made the system complete. By these rules steamers blow 1 long blast at intervals in a fog, 1 short blast if keeping to starboard, 2 if keeping to port, and 3 if backing. Sail-vessels blow a mechanical horn; 1 blast for the starboard tack, 2 for the port tack, and 3 for running free. Vessels at anchor toll the bell at short intervals.

Course Signals.—In addition to the above-mentioned fog signals, various propositions have at times been submitted to different governments for the introduction of a code of signals that should designate the course a vessel is heading in a fog. One system has been adopted in Sweden, and that government is at present making endeavors to have it made general.

Ahlborg's Code.—In this code 2 whistles are used,—a shrill treble and a deep bass. North is denoted by a blast of the treble whistle. N. E., one treble and one bass. E., one treble and two bass. S. E., one treble and three bass. S., one bass. S. W., one bass and one treble. W., one bass and two treble. N. W., one bass and three treble.

Telegraphic Signals.—The first military code of telegraphic signals of which well-authenticated information exists was devised in France, in 1793. This consisted of a semaphore, having two pivoted and jointed arms, by which combinations representing letters of the alphabet could be readily made. This system was adopted in the French navy, and was shortly afterward introduced into the British navy in a modified form. A system upon the same basis was introduced in the U. S. navy about 1830. The principles of this system are used at present in European navies; but in that of the United States, the semaphoric method has been replaced by Myer's code, consisting of combinations of two elements, expressing the letters of the alphabet. This system is transmitted by day by means of swinging flags, and at night by swinging lanterns.—*Edward W. Very, Lieutenant U.S.N.*

SIGNAL-BOOK. A book in which signals are recorded. A book containing the code of signals. Signal-books are bound with metal, so as to sink in case of capture, and are kept in the cabin.

SIGNAL-CHEST. A chest on the poop, arranged with pigeon-holes for signal-flags.

SIGNAL-FLAGS. The flags used in signaling.

SIGNAL-LOCKER. A locker to contain signal-flags.

SIGNAL-MAN. A man who makes and reads signals.

SIGNAL-OFFICER. The officer charged with the supervision of signals.

SIGNAL-QUARTERMASTER. A petty officer who has charge of the signals, lights, lanterns, etc.

SIGNALIZE. To make signals to.

Signing-officers (*Eng.*). Officers accountable for stores, who sign the receipt therefor.

Signs of the Ecliptic, or Zodiac. The ecliptic is divided into twelve equal portions called *signs*, each occupying 30° of its circumference, commencing from the vernal equinoctial point, or first point of Aries. The names of the signs, in order, with their several symbols, are as follows: *Aries*, ♈, *Taurus*, ♉, *Gemini*, ♊, *Cancer*, ♋, *Leo*, ♌, *Virgo*, ♍; *Libra* ♎, *Scorpio* ♏, *Sagittarius* ♐, *Capricornus* ♑, *Aquarius* ♒, *Pisces* ♓. The first six are the northern, and the last six the southern signs. These are the names also of the twelve *constellations* of the zodiac; and when this notation was established, "the signs of the ecliptic," or, as they are sometimes called, "the signs of the zodiac," coincided in position with the "constellations" of the same name, which name, consequently, the sign took. This coincidence, however, no longer exists. The vernal equinoctial point, or first point of Aries, from which the divisions of the ecliptic commence, has a slow retrograde motion along the ecliptic, so that it is no longer in the constellation of Aries, but is now situated in that of Pisces, and so for all the "signs" whose position is defined by that of the origin; they have retrograded with respect to the corresponding constellations, or, which is the same thing, the constellations have progressed relatively to them, the constellation Aries now occupying the sign Taurus, the constellation Taurus the sign Gemini, and so on. Hence it must be particularly observed that the signs of the ecliptic are now regarded as purely technical subdivisions, and are not to be confused with the constellations of the same name, though they were originally identical. In former times it was usual to note the longitude of a heavenly body in *signs*, *degrees*, *minutes*, and *seconds*, a sign being equal to 30°.

Silence! A command to the men at the guns, when they all face the gun, and await in silence further orders.

Sill. A young herring. The timber at the base of a dock-entrance, against which the gate shuts. The upper and lower part of the frame of a port.

Sillock (*Eng.*). Young coal-fish.

Silometer. A speed measurer; a log towed in the wake of the ship, registering the speed. See Log.

Silt. Soft, oozy sediment. *To silt up*, to become choked up with mud or sediment.

SILT-GROUNDS. Deep-water fishing banks off Jamaica.

Siluridan. A fish of the family of which the genus *Siluris* is the type.

Siluris. A genus of large malacopterygious fishes, without true scales, and found in the inland waters of Europe, Asia Minor, etc.

Silver-fish. A fish of the size of a small carp, having a white color, striped with silver lines.

Silver-oar (*Eng.*). A badge of a maritime court.

Silver-thaw. The ice falling in large flakes from sails and rigging.

Simoom. A hot, dry wind, blowing from the Arabian deserts.

Simpson, Edward, Commodore U.S.N. Born in New York. Appointed from New York, February 11, 1840; attached to sloop "Decatur" and frigate "Potomac," Brazil Squadron, 1840–41; returned to the United States in frigate "Constitution," 1841; attached to frigate "Independence," Home Squadron, 1841–42; attached to frigate "Congress," Mediterranean and Brazil Squadrons, 1842–45; attached to receiving-ship "North Carolina," 1845; Naval Academy, Annapolis, Md., 1845–46.

Promoted to passed midshipman, July 11, 1846; war with Mexico; attached to steamer "Vixen," 1846–47; present at attack on forts of Alvarado, under Commodore Connor; at two attacks on Tabasco, under Commodore Perry; at capture of Tampico, under Commodore Perry; at capture of Tuspan; at capture of Coatzacoalcos; at capture of Laguna de Terminos. At siege of Vera Cruz, covered the landing of the U. S. army, and took part with the rest of the Mosquito Fleet in the bombardment of the city of Vera Cruz and of the Castle of San Juan de Ulloa; attached to coast survey, 1848–50; attached to frigate "Congress," Brazil Squadron, 1850–53; attached to Naval Academy, as assistant instructor in naval gunnery and infantry tactics, 1853–54.

Promoted to master, July 10, 1854; coast survey, 1855–56.

Commissioned as lieutenant, April 18, 1855; attached to sloop "Portsmouth," East India Squadron, 1856–58; engaged with Commander A. H. Foote in the bombardment and capture of the Barrier Forts in the Canton River; attached to Naval Academy, in charge of instruction in theory and practice of naval gunnery, 1858–62; commandant of midshipmen, at Naval Academy, 1862–63.

Commissioned as lieutenant-commander, July 16, 1862; commanding ironclad "Passaic," South Atlantic Squadron, 1863–64; engaged with Fort Wagner, July 29, 1863; Fort Sumter, August 17, 1863; Fort Wagner, August 18, 1863; Fort Sumter, August 23, 1863; Fort Moultrie, August 31, 1863; Fort Sumter, September 1, 1863; Battery Bee, September 8, 1863; Fort Moultrie, November 16, 1863; commanding steamer "Isonomia," off Wilmington, in East Gulf Squadron, and on Bahama Banks, 1864; fleet-captain, Blockading Squadron, 1865–66; engaged in operations before Mobile, from March 27, 1865, to April 12, 1865, when the city capitulated.

Commissioned as commander, March 3, 1865; commanding steam-sloop "Mohican" and steamer "Mohongo," North Pacific Squadron, 1866-68; in charge Hydrographic Office, Washington, 1868–69; assistant to chief of Bureau of Ordnance, Navy Department, Washington, 1869–70.

Commissioned as captain, August 15, 1870; special service in Europe, 1870–72; commanding Torpedo Station, 1873; commanding steam-frigate "Franklin," North Atlantic Station, 1873–74; commanding frigate "Wabash," North Atlantic Station, 1874; commanding Torpedo Station, 1874–75; commanding steam-sloop "Omaha," South Pacific Station, 1875–77; navy-yard, New York, 1877–78.

Promoted to commodore, April 26, 1878; commandant Naval Station, New London, Conn., 1878–80.

Sing. To cry out in hauling on ropes,—not tolerated in the navy. *To sing out*, to cry out.

Single. To unreeve the parts of a doubled rope, as tacks and sheets.

Single-acting Engine. An engine in which the steam acts on one side of the piston only.

Single Anchor. A ship is at a single anchor when only one anchor is down.

Single-banked. When but one man on a seat rows a single oar, a boat is said to be *single-banked*. Gigs, dingeys, and whaleboats are single-banked.

Single-block. A block with but one sheave.

Singlestick. A wooden sword, used in broadsword exercise.

Sinical Quadrant. An instrument formerly used to work out traverses.

Sinking-head. An extra length on a casting, into which the poorer metal sinks, and is cut away. Also called *sprue-head*.

Sinnet. See SENNIT.

Sirius, or Dog-star (Gr. *Seirios*, from *seirein*, to scorch). The bright star *α Canis Majoris* is so called for the following reason: In ancient times the heliacal rising of this star followed close upon the summer solstice. This, in the Mediterranean latitudes, was the season of the greatest heats, unhealthy and oppressive, and during which dogs were liable to madness. The Egyptians called this star *Sothis*, and from its heliacal rising were warned that the annual overflow of the Nile was about to commence. Owing to the precession of the equinoxes the heliacal rising of Sirius has slowly changed; it takes place now about August 10.

Sirmarks. Stations marked upon the molds for the frame-timber, etc., indicating where the bevelings are to be applied.

Sirocco. A hot and dry wind, southeast in Italy, blowing from the desert.

Sissoo. A kind of Indian ship-timber.

Sister-block. A double-block, having one sheave over the other, the shell being in one piece. It is seized in between the two forward topmast shrouds.

Sister-hooks. A pair of hooks, working on the same axis, and closing into one, fitting closely in that position.

Sister-keelsons. A pair of keelsons placed on each side of the middle line.

Sister-ships. Ships made on the same model, and rigged alike.

Sitch. A little stream of water, dry in summer.

Six-upon-four (*Eng.*). Rations reduced at the rate of 6 to 4 men.

Six-water-grog (*Eng.*). Grog weakened to six parts of water, for punishment.

Size-fish. A large whale, whose whalebones are at least 6 feet long.

Sizing. A gelatinous solution used in painting, gilding, etc.

Skate. A cartilaginous fish of the genus *Raia*, having the body flattened, the skin set above with spines or thorns, the branchial openings below, and cartilaginous flaps extending from the nose backward toward the pectoral fins, which last form broad, lateral expansions, and give the whole body a rhomboid form. It is wholly marine, and is found in all parts of the world. The *Raia batis*, called the *skate*, *gray skate*, or *blue skate*, weighs sometimes 200 pounds, and is used for the table.

Skate-lurker. Cant for a begging impostor in sailor-clothes.

Skeat. The star *β Pegasi.* See PEGASUS.

Skeel. A wooden bucket, or water-kid.

Skeer. See SCAR.

Skeet. A long-handled scoop, used to wash the sides of a ship, and formerly, to wet the sails.

Skee-tack. A name for the cuttle-fish.

Skeg, or Skegg. A projecting stump formerly left on the keel, abaft the stern-post. The after-end of the keel. The composition piece supporting the heel of an equipoise rudder.

SKEGG-SHORES. A name for the shores under the after part of the keel, when launching a ship.

Sker, or Skerry. A flat rock, always above water.

Sketching. The art of sketching is of the greatest practical utility to the naval officer, and in every branch of his profession an ample field is afforded for the exercise of this accomplishment.

Most of the popular and scientific magazines and journals are filled with skillful reproductions of pen or pencil sketches, and indeed a descriptive article is hardly considered complete without these embellishments.

The intimate relation of drawing to almost every art and trade is generally recognized, and in the principal countries of Europe the instruction of artisans in the uses of pen, pencil, and brush is encouraged by the government.

It is not presumed that one should necessarily be an accomplished artist in order to produce very useful and creditable plans and sketches. Enough for practical purposes can be done by any intelligent person who will devote a reasonable amount of time to acquiring a few rudimentary principles and sufficient practice.

Whatever may be the advantages of the camera, that valuable instrument is not always at hand, and when it is, circumstances beyond our control often prevent its use; this is especially apt to be the case at sea.

In time of peace many of our naval officers will be employed in surveying, and on squadron service no officer is more usefully engaged than when collecting and transmitting the information which his surroundings afford. Designs of the novel vessels now building in Europe, fortifications, breakwaters, landmarks, approaches to harbors, and new inventions in artillery can in no way be so clearly and accurately described as by sketches.

In time of war there can be no question about the advantages of an art which is capable of presenting at a glance the order of battle, plan of attack and defense, positions of fortifications and obstructions, and the manifold considerations that must influence the movements of a commander.

The report of the Honorable Secretary of the Navy for 1879 is an example of the Department's encouragement and appreciation of such efforts. Our text-books on seamanship and gunnery teem with illustrations, and every inventor, to present clearly his ideas, must be aided by sketches and plans.

To the marine surveyor the art is invaluable. An officer who has seriously tried to sketch during the progress of a survey will often be gratified, if not surprised, at the amount of information which even very crude sketches may afford. The pencil is of course the chief instrument for such delineations,—a hard one is best, and drawing-blocks or sheets of paper are necessary. With these simple appliances the boat-officer will be able to sketch in the coast-line, while from the ship the more general outlines of the country surveyed may be drawn. Such work will probably represent only a rough outline, stained by the salt spray and very "shaky" in execution, but if it be neatly copied in the sketch-book before the scene is forgotten, minor details may be supplied, and the purpose is accomplished. Circumstances rarely admit of the selection of positions for pictorial effect, but there are certain essentials which should if possible be complied with.

The main object is the selection of a station, or point of view, the distance of which from the scene or object should not be less than the width of the latter,—in many cases it may be greater,—but where the distance equals the width of the scene, the angle of vision will not be much less than 60°, which is the greatest the eye can take in at one view. Having determined on and occupied this position, and chosen the objects that are to constitute the front of the picture, the paper having been previously cut nearly the size of the intended drawing, the delineator holds it up with his left hand before the scene, its lower edge corresponding with the front line of those objects, at such distance from his eye that the width may exactly comprise the scene to be drawn. With the paper in this position let him first mark on both its sides the exact intersections of the horizon which connect by a line across it, opposite to this mark the point of sight. On the sides and upper and lower edges mark the places, the heights and widths of the principal lines and objects.

With the assistance of these marks and the point of sight, and frequent careful references to the scene, the objects may be drawn in their proper places and in tolerably good perspective, which may afterward be verified and corrected by rule. The thickness and force of the various marks and lines must be graded to the distance of the objects they respectively represent. In sketching, this is a great aid to perspective effect; and by beginning first the distance with a finely-

pointed pencil, the marks, as they approach the foreground, will of themselves acquire increased thickness by the wearing down of the point. Care must be taken to avoid too many marks and lines, which will produce a confused effect, and is a common error with beginners, who should study to attain the smallest number of marks that will correctly denote the character of the object. Increased boldness in the outlines of the foreground may be produced by using a softer and blacker pencil; this will often assist the perspective effect by increasing the idea of their nearness to the spectator.

These are the main points to be attended to in a sketch from nature, so far as perspective is concerned. The character of details, such as the representation of kinds of foliage, should vary according to the distance, which will, in some degree, assist the perspective idea of distance. No precise directions can be laid down for the representation of the objects of nature; almost every artist has a way or *touch* of his own by which he conveys his ideas, and this is best acquired by a contemplation of the objects themselves and studies of the works of the best masters.

The proper management of *light and shade*, and their judicious arrangement into breadths and masses, called by painters *chiaro-oscuro*, are also valuable aids to the perspective effect of a landscape. It is a common mistake with the novice to appropriate to each individual tree, figure, house, or other object its own light and shade, irrespective of the general effect. The consequence is that the picture is cut up into a great number of lights and shadows of nearly equal size and intensity, alternating over the entire surface of the picture, by which means the eye is distracted, and cannot rest with satisfaction on any portion of it, since all the objects depicted are thus made to present nearly equal claims to attention. The avoidance of too many lights, the placing of the principal object in one larger and more intensely illuminated space, the keeping of other lights subordinate to it, and the proper regulation of the contrasts between light and shadow, according to distance, all tend to direct attention to the principal object, and to preserve the proper *keeping* of the picture. The same may be said of the shadows. There should be one principal shadow, to which the others should be subordinate; they should not be too much subdivided into numerous small shadows, but a proper degree of breadth of shade should be maintained undisturbed by intervening lights, which will much contribute to the repose of the picture.

Every landscape may be divided with greater or less precision into three parts,—the distance, the middle-picture, and the foreground. As the effect of distance is to subdue both lights and shadows, the first of these seldom plays a conspicuous part in the general arrangement of the *chiaro-oscuro*, although the deep blue of a distant mountain in full shadow is sometimes effectively introduced. The largest breadth of shade is generally spread over the middle-picture, while the deepest shadows, as well as the strongest lights, naturally, from its proximity, occupy the foreground.

Sometimes, however, this order is reversed. In this case a few strong and scattered touches of light falling on objects in the foreground contrast very effectively with its dark tints. In daylight scenes, in nature, the principal light is generally in the sky; but in a showery or stormy sky, when the sun is supposed to be shining, but not from within the limits of the picture, the entire sky may often be in half-shadow, with the principal light in the foreground or middle-picture.*

Guided by these simple instructions, it is supposed that a sketch of a harbor, bay, or island has been made in pencil. To render such work more permanent and give a greater effect the sketch may be finished in India-ink, sepia, or water-colors by the aid of the pen or brush. Pen and ink are chosen for our present purpose as being best adapted for photolithography and the most simple. A photograph may be taken directly from such a sketch, and to obtain the best results it is necessary to pay particular attention to clearness, and draw the picture a little larger than required in the published sketch.

The ink used should be of the best quality, free from hardness and grit, and susceptible of a deep, brilliant, black tint when sufficiently ground on the saucer. Distilled water is preferable for grinding, and if the sketch is to be photographed a little alum may be mixed with the ink, which will neutralize its brilliancy. If flies are troublesome, a small quantity of ox-gall added to the ink will prevent the sketch being spoiled by their encroachments. For very fine work the ink may be ground to advantage on the thumb-nail. The saucer should be thoroughly cleaned and wiped before and after use; any particle of grease destroys the fixing and fluid qualities of the ink.

Hot-pressed drawing-paper or Bristol-board is the best to use for such sketches. The pens best adapted for free-hand work are Gillott's No. 303, the mapping-pen, No. 291, and the lithographic pen, No. 290; with these grades all delineations from the finest to the coarsest may be made, but in skillful hands the 303 pen, like the *moyen* pencil, suffices for all ordinary purposes. The character of the pencil-lines should be accurately rendered by similar touches of the pen and tints of ink.

The amount of finish necessary to the sketch depends upon the time and facilities at the disposal of the delineator. In general, on shipboard, it is not convenient to be too minute; the refinements may be left for office-work, where good light, steadiness of position, and command of the best materials will conduce to greater neatness and accuracy.

English surveying-vessels are usually provided with a large, airy, well-lighted house on the upper deck devoted exclusively to the use of the surveyors and draughtsmen.

An important point not to be omitted in the sketch is reference to the point of view by bearings, which should be carefully noted.

The best time for making sketches is either in the morning or evening, when the effects of light and shade are most favorable.—*George P. Colvocoresses, Lieutenant U.S.N.*

Skew. Awry. A rudely-made boat in English waters.

Skewer-pieces. Pieces of salt meat without bone.

* I am largely indebted to a manual of drawing by R. S. Burn, Esq., for the foregoing directions.

Skiddy-cock (*Eng.*). The *water-rail.*

Skider (*Eng.*). The *skate.*

Skids. Pieces of timber temporarily fastened to the rail or side, to absorb the chafe in hoisting. Pieces of plank under a vessel's bottom for getting her afloat, when ashore. *Boat-skids* are frames in which boats are built, or in which the boom-boats rest. *Landing-skids* are short pieces of plank running from the gunwale to the beach, and are used in boats, for the purpose of landing the guns. *Gun-skids* are beams arranged in parallel lines, in a gun-park, on which the guns are laid.

SKID-BEAMS (*Eng.*). Beams raised on stanchions on the spar-deck of a sloop, where booms and boats are stowed.

Skiff. A small light row-boat. (*Eng.*) A sail-boat like a sloop, but with no bowsprit.

Skilly. Oatmeal broth in which meat has been boiled.

Skillygalee. A drink of oatmeal and water.

Skin. The inside or outside planking of a ship. The outside part of a sail when furled. *To skin up a sail*, to pull it up in furling until the outside part is taut and smooth.

Skip-jack. A fussy, trifling officer; an upstart. The *bonita*, a small fish. A small porpoise.

Skipper. The master of a merchant vessel. A familiar appellation for the commanding officer of a man-of-war. The saury-pike, *Scombresox saurus.*

Skirling. Small salmon or trout.

Skiver. A dirk. A fork.

Skoorie. A full-grown coal-fish.

Skout. The guillemot, or auk.

Skouther. The stinging-nettle, or jelly-fish.

Skow. See Scow.

Skrae-fish (*Eng.*). Fish sun-dried without salting.

Skua. A kind of sea-gull.

Skulker. A shirker; a coward who lurks below during action.

Skull-fish. A whale more than two years old.

Skunk-head. The pied duck, *Anas Labradora.*

Skurrie. The shag, *Phalacrocorax graculus.*

Sky-gazer. A fish called *Uranoscopus.* A light triangular sail, set flying above the royal.

Skylarking. Frolicking; scuffling or running about decks. It formerly meant mounting to the mast-head, and sliding down the royal backstays.

Skylight. A hatch covered with glass, admitting light to the deck below.

Sky-sail. The next sail above the royal. Often carried in merchantmen, and sometimes set flying. The sail above it was the sky-scraper, if triangular; the moon-sail, if square.

SKY-SAIL MAST, or SKY-SAIL POLE. The upper portion of a royal mast when used for a sky-sail. Sometimes it slides on the royal mast, like a *sliding-gunter.*

Sky-scraper. A triangular sail set above the sky-sail, or above the moon-sail, when it is often called a *star-gazer.*

Slab. The outside cut of a tree.

Slab-lines. Ropes led through blocks on the yard or under the top, and thence abaft to the foot of the courses. Their use is to haul the sail up snugly.

Slack. A *slack rope*, one hanging loose. The *slack*, the loose part of the rope. *To slack off*, to ease up, or relieve the strain on a rope. *Slack helm*, with the helm carried habitually too much alee. This occurs often when too much down by the stern, or when there is too much head-sail. *Slack in stays*, a term applied to a ship that is slow in tacking; also, jocularly, to a lazy man. *To slack up*, to ease off or veer out. *Slack-tide*, or *slack-water*, the interval between ebb and flow, either at high- or low-water. *The tide slackens* when its velocity becomes less.

Slag. A glass-like substance formed in a blast-furnace by the combination of the silica, alumina, lime, etc., contained in the ore and flux. It floats, in a molten state, upon the surface of the metal, from which it flows through suitable apertures.

Slake. Mud or ooze in a river-bed.

Slant of Wind. A temporary breeze; also, the duration of a favorable breeze.

Slant Tack. The most favorable tack; the *long leg.*

Slatch. A transitory breeze.

Slee. A cradle placed beneath a ship when hauling her up for repairs, as at a marine railway.

Sleep. A sail *sleeps* when well filled and quiet.

Sleeper. A large acanthropterygious fish of the family *Gobiodæ*, the species of which are natives of warm climates, living in fresh water, and concealing themselves in the mud; *Eleotris dormatrix.*

Sleepers. Pieces of curved timber which are fayed and bolted upon the transoms and counter-timbers inside the ship to strengthen the stern. The lower tier of casks.

Sleeve. A strait, or narrow channel.

Sleeve-fish. The squid, *Loligo vulgaris.*

Slice. A bar used by whalers, to strip fish with. A tapering piece of plank, driven between the timbers of a ship before planking. A wedge driven under the keel in launching.

Slice-bar. A bar with a knife-shaped end, used in furnaces to clear the grate of clinkers.

Slide. A smooth piece, or a part of the frame of a machine, upon which another piece slides or is guided; as, the *cross-head slide* of a steam-engine, the *slide* of a gun-carriage, etc.

SLIDE-BAR, or SLIDE-ROD. A bar or rod for communicating motion from one piece to another, constrained by guides so as to move or *slide* in direction of its length only.

SLIDE-VALVE. A valve that is opened or closed by sliding it over its seat, which contains ports or openings, usually rectangular in cross-section, for the passage of a fluid. It is extensively used in the steam-engine for alternately admitting and releasing the steam to and from the cylinder; and for this purpose it is so arranged that one reciprocating piece performs these functions for both ends thereof. The simplest form is the *three-ported valve*, in which the valve-seat contains three rectangular ports, placed side by side a short distance apart, the two outer ones communicating with their respective ends of the cylinder, and the middle one with the exhaust-pipe. The valve, in the middle of whose face is a niche or recess of sufficient size to span the middle port and one of the end ports, when in mid-position and the engine on a dead centre, covers all the ports; but when

moved in either direction, one of the end ports is uncovered to the live steam surrounding the back of the valve, the other releasing the exhaust steam through the niche in the valve-face and the middle port. Slide-valves having *lap* are enabled to effect a *cut-off* within moderate limits. *Double-ported* valves have two steam and exhaust openings at each end, thereby reducing the length of their stroke. There are many devices for relieving the bases of valves from the steam-pressure, such as the *D-valve*, the use of *balance-rings*, etc.

SLIDING-BAULKS. The floor-timbers of a cradle, sliding on the bilge-ways when the ship is launched.

SLIDING BILGE-BLOCKS. Large blocks with their upper parts fitted to the form of the ship's bottom, sliding from the dock-steps into place.

SLIDING-GUNTER. A mast of two pieces, the upper sliding up and down the lower by means of hoops or rings. Used for boats, and sometimes for sky-sails, etc.

SLIDING-GUNTER SAIL. A triangular sail bent to a sliding-gunter mast. A handy form of boat's sail, reefing quickly by lowering the upper part of the mast.

SLIDING-KEEL. A sliding-keel or centre-board is an arrangement invented about the year 1800 by Capt. John Shanks, R.N. It consists of a well-room or case placed amidships, and carried above the deepest load-line, generally to the deck. It contains a board made to travel up and down, as the vessel may be required to sail off or on the wind; it is used principally in yachts and coasters where a light draft of water is needed. Shuldham's sliding-keel was triangular, the broadest part being aft.

SLIDING-WAYS. Sliding-ways, or launching-ways, are the ways which are prepared for and used in launching a vessel; they are placed at an inclination sufficient to allow the ship to slide gradually into the water.

Sling. To suspend in ropes. To hang the yards with spare chains on going into action. To attach the clews to a hammock. A rope or chain strap fitted to encircle any object, so as to suspend it. The chains that suspend the lower yards and gaffs. *Yard-slings* are of strong chain, going around the lower mast-head, and connecting to the yard by a slip-bolt. *Gaff-slings* are of chain or wire rope, supporting the gaff from above. *Boat-slings* are lengths of chain terminated by a large link, placed in the bow and stern of the boat to hook the tackles into. *Buoy-slings* are rope fittings about a wooden buoy, to which the buoy-rope is so attached that the buoy will ride upright. *Butt-slings*, or *barrel-slings*, are used in hoisting casks. *Gun-slings* are iron chains parceled and marled together for a part of their length, and having a piece of rope fastened to them to pass about the chase of the gun. *To get into a sling*, a jocular expression, signifying to get into difficulties.

SLING-BAND, or SLING-HOOP. An iron band on the yard, to which the slings are fastened.

Slip. To let go suddenly; as, to *slip* the cable. An inclined plane on which ships are built. An opening left between docks or wharves. An inclined plane, up which ships may be drawn for repairs. An insurance memorandum, given to the underwriters for their signatures. The difference between a vessel's speed and the speed that would be attained if the propelling device acted upon a solid or immobile substance instead of a fluid. It is usually expressed as a fraction or *per centum* of the speed due to the action of the centre of effort of the propeller on a solid.

SLIP-KNOT, or SLIP-NOOSE. A knot which will travel along a rope or spar; a running-noose.

SLIP-ROPE. A rope so arranged that it may be slipped or let go suddenly.

SLIP-SHACKLE. A shackle consisting of a long bolt with a ring, confining it to its own part, and, when struck off, allowing it to slide through the chain to which it is fastened.

SLIP-STOPPER. An arrangement for letting the anchor go. Usually, the ends of the anchor-stoppers have a tongue held in a *trip*, which is held by a trigger and controlled by a line, so that one man may detach both stoppers.

Sloop. A small vessel having one mast, with a jib, stay-sail, mainsail, and gaff topsail. It differs from a cutter in having a fixed bowsprit and stay for the jib. A war-vessel next in size to a frigate. Before the introduction of steam, a sloop-of-war carried from 18 to 32 guns. As now understood, any vessel, larger than a gunboat, carrying guns on one deck only.

SLOOP-RIGGED. Rigged like a sloop, with one mast and a fixed bowsprit.

Slope of Wind. A slant of wind.

Slops (*Eng.*). Ready-made clothes and other furnishings for seamen.

SLOP-BOOK. A register of small stores issued.

SLOP-ROOM. The issuing-room, or store-room for small stores.

SLOP-SHOP. A shop where sailors' ready-made clothing, small stores, etc., are sold.

Slow-match. See MATCH.

Sludge. Thin, slushy ice, just forming. Broken ice in polar seas.

Sludge-holes (*Eng.*). Mud-holes of boilers.

Slue. To turn around; to twist about.

SLUED. Stupefied by drink; tipsy.

SLUE-ROPE. A rope for turning a gun, spar, etc.

Slush. The melted grease from the meat in the coppers. Dirty snow, soft mud, etc. To grease with slush. *To slush down*, to grease the spars after scraping them.

SLUSH-FUND. Money obtained from the sale of slush. It is to be used for premiums for target firing, etc., and not for ship's purposes.

SLUSH-ICE. The first young ice.

Sly-gorse. The shell-drake, *Tadorna vulpanser*.

Smack. A small vessel, rigged like a cutter or a sloop, sometimes with a square topsail.

Small. The small part of a whale's tail. The shank of the anchor, immediately below the stock.

Small-arms. Fire-arms, carried in the hand, and fired from the hand or shoulder.

SMALL-ARM AMMUNITION. Ammunition for rifles, pistols, etc. It is generally *fixed ammunition*, and is stowed in boxes, kept in the shell-room or torpedo-room. Metallic cartridges are now used.

SMALL-ARM MEN. Men trained and selected to use small-arms in boarding, etc.

Small Bower. Formerly, the bower-anchors were of different sizes, in which case the port anchor was the *small bower*.

Small Helm. That condition of the steerage of a ship when but a slight movement of the helm is required to accomplish good results. The subjection of a talkative, turbulent bully by decisive measures.

Small Sails. All the lighter sails except the studding-sails.

Small Stores. Soap, needles and thread, tobacco, spices, tin-ware, razors, brushes, and various other articles, issued to the men through their mess-cooks once a fortnight.

Small-stuff. The general name given to all of the smaller descriptions of rope or cord which is required for use on shipboard.

The term includes spun-yarn, marline, houseline, roundline, and the smaller sizes of seizing- and ratline-stuff (all of which are made of hemp and tarred), and the corresponding sizes of untarred line, made either of flax or manilla.

In the manufacture of all these varieties, the finest quality of fibre is or should be used, except for spun-yarn, which is of a coarser description and requires less strength and finish. The long fibre of the tow, called *barr*, is generally used for that purpose.

Spun-yarn, marline, houseline, and roundline are made by the process of hand-spinning, as follows: at each end of the spinning-room, which is several hundred feet in length, wheels are placed which are turned by hand, and connect by means of bands with several small hooks or *whirls* supported in an open box. The spinner secures a bundle of hemp about his waist with the ends fastened behind, attaches a small quantity of the fibre to one of the whirls, which is revolved by the wheel, and walks backward the length of the room, by which movement the fibre is drawn from the bundle.

The thread or yarn is held in the right hand of the spinner (a piece of flannel being used to protect the hand from friction), the thumb and forefinger serving as a gauge to regulate the size and uniformity of the yarn, while the supply is regulated by the left hand, either faster or slower as may be required. The requisite amount of skill to spin a uniform yarn of a given size can only be obtained by long practice, but by a good workman a yarn of greater evenness and strength can be spun by hand than by machinery.

Upright posts placed in the floor at regular intervals have horizontal arms attached at right angles to the walk of the spinner, which are called *stake-heads.* Iron pins or bolts are driven into the upper edges of the stake-heads and hold the yarns in position, as the spinner, in passing, places the yarn upon it.

Two or three spinners follow each other at intervals of a few feet. Having reached the end of the room, a bell is rung as a signal to stop the wheel, and the ends of two yarns are knotted together and the bight placed over a hook. At the same time the man who turns the wheel detaches the yarns from the whirls, secures them to another whirl which is turned in the opposite direction by the crossing of its band, and by which the yarns are twisted together or laid up. A bundle of the completed lengths is called a *junk*, the number of which it is composed depending upon the weight.

Yarns for spun-yarn, marline, and houseline are spun from left to right, and are twisted or laid from right to left. Yarns for roundline are spun in the opposite direction and laid up *right-handed.* Spun-yarn may be made of two, three, or four yarns. They are simply twisted together, but not laid. It is used for the more common and rougher purposes, such as for service to protect certain parts of the rigging from chafe, bending sails, etc.

Roundline, houseline, and marline are made with greater care, and in laying the yarns a *top* is used to give closeness and regularity to the lay. The latter is composed of two yarns or strands; the others have three yarns, but roundline is somewhat larger than houseline, and is used principally in serving the lower rigging and stays. All of these different kinds of small-stuff are tarred in the junk.

The different sizes of ratline- and seizing-stuff are distinguished by the number of yarns or *threads* of which they are composed. Their names imply the uses for which they are intended. Ratline-stuff is a little larger than seizing-stuff of the same number of threads, and it is also laid up with less twist, by which it is rendered more pliable. The threads may be spun by hand or by machinery, but they must be tarred before being twisted and laid. The larger sizes of ratline- and seizing-stuff are made by the same machinery as the various sizes of rope, the strands being *tubed*, or drawn through tubes, into which they fit closely, previous to being twisted. The smaller sizes, however (12-thread and less), are not tubed, but the threads are extended to their full length and twisted to form the strand, and the strands are then laid. The machine for this purpose is similar to that used in the manufacture of rope, but is of more simple construction. See Rope.—*E. T. Strong, Lieutenant U.S.N.*

Smart-money (*Eng.*). The pension given for wounds.

Smart-ticket (*Eng.*). A certificate from a captain or surgeon, for a pension for wounds.

Smasher (*Eng.*). A seaman from the north of England.

Smear-dab. A kind of flat-fish; the *Pleuronectes lævis.*

Smelt. A small fish (*Osmerus eperlanus*), allied to the salmon. It is of a silvery-white color, and is highly esteemed as a delicate food. It emits a peculiar odor, whence the name; called also *spirling.*

Smerlin. A certain fish; *Cobitis aculeata* of Linnæus.

Smew. The *Mergus albellus*, or white-headed goosander.

Smith, John, was born at Willoughby, Lincolnshire, England, in January, 1579. In 1606–7 he was associated with Newport in his expedition to Virginia, and was left there to manage the little colony at Jamestown. In 1608 he surveyed the Chesapeake Bay, Chickahominy and Potomac Rivers, and gave names to several of the islands he encountered on the voyage, and also made a map of his voyage of discovery. In 1609 he left Virginia never to return. In 1614, with two ships, fitted out by some London merchants, he explored a large portion of the North American coast, to which he gave the name of New England, and of which he formed a tolerably accurate map. In 1615 he made another voyage to New England for the purpose of founding a colony, but was captured by a French man-

of-war and taken to New Rochelle. Afterward he claimed to have participated in sea-fights for the French against the Spaniards. About 1616 he received the title of Admiral of New England, and was thenceforth engaged in promoting American colonization by means of a series of publications on America, written either by or for him. He died in London on June 31, 1631.

Smith, Melancthon, Rear-Admiral U.S.N. Born in New York, May 24, 1810. Appointed from New York, as acting midshipman, March 1, 1826; from July 22, 1826, to June 15, 1830, attached to frigate "Brandywine" and sloop "Vincennes," Pacific Squadron; Naval School, 1831; frigate "Potomac," May 3 to June 28, 1831; navy-yard, New York, from June 28, 1831, to January 19, 1832.

Promoted to passed midshipman, June 1, 1832; sloop "St. Louis," West India Squadron, August 8, 1832, to December 14, 1832; navy-yard, Pensacola, December 14, 1832, to July 21, 1833; brig "Porpoise" and sloop "Vandalia," West India Squadron, from July 21, 1833, to August 15, 1834; navy-yard, New York, July 20, 1835, to November 4, 1835.

Promoted to master, 1836; sloops "Natchez" and "Vandalia," West India Squadron, from 1836 to 1838.

Commissioned as lieutenant, March 8, 1837; steamer "Poinsett," operating against the Indians in Florida, from June, 1839, to March, 1840; commanded a fort and a 20-oared barge for one month, in 1839, during the Florida war; navy-yard, New York, 1841; sloops "Fairfield" and "Preble," Mediterranean Squadron, from April 23, 1841, to September 5, 1843; receiving-ship at New York, from November, 1843, to October, 1844; store-ship "Erie," from October, 1844, to December, 1844; sloop "Vandalia" and steamer "Colonel Harney," Home Squadron, from December, 1844, to January, 1846; executive-officer of Pensacola Navy-Yard, January, 1846, to April, 1848; frigate "Constitution," Mediterranean Squadron, from September, 1848, to January, 1851; waiting orders, 1851.

Commissioned as commander, September 14, 1855; executive-officer of frigate "Potomac," while she was flag-ship to Flag-Officer Paulding, June, 1855, to October, 1855; light-house inspector, October, 1857; commanding at different times the steamers "Mississippi," "Massachusetts," and "Monongahela," Gulf Blockading Squadron, from May 1, 1861, to June 22, 1863. While commanding the "Massachusetts," engaged a fort at Ship Island, July 9, 1861, and 3 Confederate steamers and a revenue-cutter off Ship Island in 1861; engagement with rebel steamer "Florida," Mississippi sounds, October 26, 1861; cut the telegraph-wire between Shieldsboro' and Pass Christian, September 20, 1861; capture of a battery of 2 guns at Beloxi; December 31, 1861, while commanding the steamer "Mississippi," was in the attack and passage of Forts Jackson and St. Philip, and the capture and destruction of the rebel ram "Manassas," April 24, 1862. Flag-Officer Farragut, in his official report, says, "Just as the scene appeared to be closing, the ram 'Manassas' was seen coming up under a full head of steam to attack us. I directed Capt. Smith, in the 'Mississippi,' to turn and run her down. This order was instantly obeyed by the 'Mississippi,' turning and going at her at full speed. Just as we expected to see the ram annihilated, when within 50 yards of each other, she put her helm hard-a-port, dodged the 'Mississippi,' and ran ashore. The 'Mississippi' poured two broadsides into her, and sent her drifting down the river a total wreck. Thus closed our morning's fight." Chalmette batteries, below New Orleans, April 25, 1862.

Commissioned as captain, July 16, 1862.

Capt. Smith remained in the "Mississippi," taking part in all the engagements of the squadron until March 14, 1863, when, in attempting the passage of the batteries at Port Hudson, the "Mississippi" grounded in 23 feet of water, and keeled over to port. Every effort was made to get the vessel off, but without avail, and the enemy having obtained the exact range of the ship, were hulling her at almost every shot, when Capt. Smith gave orders to fire her, which was done in four different places between decks. When the flames had gained sufficient headway to render the destruction of the vessel certain, Capt. Smith gave orders to abandon her, which was done quietly and without confusion, he being the last man to leave. By his cool and courageous bearing in the trying situation in which he was placed Capt. Smith won the admiration of all, and his course was approved by both Rear-Admiral Farragut and the Department. While commanding the "Monongahela," participated in the attacks on Port Hudson, from June 1 to 20, 1863; from June 22, 1863, to July, 1863, under orders North to report for a command,—reporting July 7, 1863; from July, 1863, to February 15, 1865, at sea, commanding ironclad "Onondaga"; temporarily transferred, April 23, 1864, by telegraph, to command of squadron in North Carolina sounds, to capture rebel ram "Albemarle"; engaged that vessel and her consort, the steamer "Bombshell," in Albemarle Sound, capturing the latter vessel May, 1864; returned to "Onondaga" as divisional officer on James River, and was permanently transferred to frigate "Wabash," for operations against Fort Fisher; participated in both attacks on Fort Fisher; 1865, navy-yard, Washington, D. C.

Commissioned as commodore, July 25, 1866; chief of Bureau of Equipment and Recruiting, Navy Department, 1866–70.

Commissioned as rear-admiral, July, 1870; commandant navy-yard, New York, 1870–72. Retired March 24, 1871.

Smiting-line (*Eng.*). A line by which a yarn-stopped sail is loosed, without sending men aloft.

Smoke. A dense, sandy vapor on the coast of Africa.

Smoke-ball. A ball which, when fired, burns with a dense smoke for several minutes.

Smoke-box. A chamber connected to a steam-boiler, in which the gases of combustion collect after having performed their work, and from which they are discharged into the smoke-pipe; as, the smoke-box of a locomotive. The term is synonymous with *front connection* and *uptake* as applied to marine boilers.

Smoke-pipe. The metallic chimney or funnel of a steam-boiler furnace. The term *smoke-stack* is in common use; but the word *stack* implies a chimney of masonry. See FUNNEL.

Smoke-sail. A piece of canvas fastened to

two small yards, hoisted on the foremast to prevent the smoke from the galley from soiling the mast. *To reef the smoke-sail*, to take it in entirely.

Smoke-ship. A novel fire-ship, invented by Meesters in 1794. See FIRE-SHIPS.

Smoke-stack. See SMOKE-PIPE.

Smoking-hours. Certain hours are designated on board men-of-war when the men may smoke. These are, during meals, half an hour after the men are called in the morning, holidays, Sundays, Saturday afternoons, and after hammocks are down, until 8 P.M.

Smoking-lamp. A small lamp with a hole in it, lit during smoking hours, so as to furnish a light for pipes.

Smolt. A salmon of from 4 to 6 inches long, and a little more than a year old, that has acquired its silver scales.

Smorth. A clear spot in the surf.

Smug-boat. A Chinese opium smuggler.

Smurlin. A mollusk; the *Mya truncata*.

Snacot. A certain fish; the gar-pike; the sea-needle.

Snag-boat. A boat used on rivers with machinery for removing snags.

Snake. To pass turns of a rope, then to pass turns across, winding from one to the other. To wind small ropes spirally between two larger ones. Backstays are snaked together, to prevent them from falling, if shot away singly.

SNAKING. Turns of a rope passed in a zigzag direction, or spirally, between two other ropes.

Snape. To cut the end of a timber off beveling, so as to fay upon an inclined plane.

Snapper. The red snapper, *Serranus erythrogaster*, a fish well known in the West Indies.

Snarl. *In a snarl*, in disorder; confused; tangled.

SNARL-KNOT. A knot that cannot be undone.

Snarley-yow. A discontented grumbler.

Snatch. To place a rope in a block for a proper lead. A *snatch* is an open lead, whether in a block or cleat. In the latter case it is called a *dumb snatch*.

SNATCH-BLOCK. An iron or wooden block with an aperture into which the bight of a rope may be introduced. They are generally of wood, and an iron strap closes the aperture; or they hinge at the hook, and close by shutting the block and clasp attached. A large snatch is called a *voyal*.

SNATCH-CLEAT. A curved cleat or chock, through which a rope may be led.

Sneer (*Eng.*). *To make all sneer again* is to strain spars and sails by "cracking on," or crowding sail.

Sneezer. A stiff gale.

Snifting-valve. A valve controlled by a spring or weight, used in the earlier forms of steam-engine previous to the adoption of the air-pump, for expelling the air and uncondensed vapor from the cylinder, which also acted as a condenser, by the impulse of the piston and its attachments. The term is now frequently applied to *cylinder relief-valves* when their action is automatic.

Sniker-snee. A fight with knives.

Snipe-fish. The bellows-fish.

Snood. A small piece of hair fastening a fish-hook to the line.

Snook. The sea-pike; the *Thyrsites atun*.

Snorter, or Snotter. A small rope bent to the end of a light yard, over which fits the eye of the lift and brace. The tripping-line leads from the other end of it to the deck, and when hauled upon pulls off the lift and brace.

Snotter. A small grommet about a mast, with an eye in it, in which a *sprit* ships.

Snow. A two-masted vessel with a boom-mainsail set on a trysail mast.

Snub. To check the motion of anything.

SNUB-POST. A bollard, or post on a dock, for fastening ropes to, in order to check a ship.

SNUBBER. A check-stopper.

Snug. A piece for wedging or otherwise combining two or more other pieces together. In a safe situation; prepared for the worst.

Sny. The line or shape given to planking put upon the curving surfaces at the bow or stern of a ship. The upward curving of the planking at the bow or stern. It is sometimes called the *spiling*.

So! Well! Right as it is!

Soak and Send (*Eng.*). Word passed for wet swabs.

Soam. The dried air-bladder of herring.

Soap, Salt-water. Soap made from cocoa-nut or palm-wood oil. It solidifies with 75 per cent. of water.

Socket. A hole into which a spindle fits. *Capstan-socket*, the socket for the capstan-spindle. *Pivot-sockets*, gun-metal sockets placed in the decks to receive the pivots of gun-carriages.

Sod-bank. The refraction of banks in the water.

Soft-laes (*Eng.*). Small coves and bays worn in soft cliffs by the action of the waves.

Soft-plank. An easy berth on the deck.

Soft-tack, or Soft-tommy. Soft bread, or fresh-made wheaten bread.

Solan-goose. The gannet, *Sola bassana*.

Solano. The sirocco.

Solar. Pertaining to the sun. See DAY, ECLIPSE, TIME, YEAR.

Soldier. A derisive term for a poor sailor. *To soldier*, to make a pretense of working without expending much force; to play the *old soldier*. The antagonism long existing between the sailor and the soldier is likewise manifested by the adage, "*Tell that to the marines*," implying that they will believe anything.

SOLDIER-CRAB. The hermit-crab.

SOLDIER'S-WIND. An especially fair wind, so that a passage may readily be made.

Sole. A marine flat-fish (*Solea vulgaris*) which, with allied species, is peculiar, among vertebrate animals, in having both eyes placed on one side of the head, namely, that side which is uppermost when they are swimming. It remains at or near the bottom of the sea. It sometimes grows to the weight of 6 or 7 pounds or more.

An additional piece on the bottom of the rudder. The lining of bilge-ways and ports.

Solid Shot. A compact projectile used for battering purposes, and distinguished from hollow shot, grape, canister, shrapnel, etc.

Solstices (from Lat. *sol*, the sun, and *stare*, to stand still). The two periods of the year, about June 22 and December 22, at which the sun attains his maximum declination. When the sun, in his annual revolution in the ecliptic, has attained his greatest northern declination, his course for the moment is parallel to the equinoctial, and, as far as change of declination is con-

cerned, he appears "to stand still"; and similarly he appears "to stand still" when at his greatest southern declination. They are distinguished as the *summer solstice* and the *winter solstice*. We must bear in mind, however, that these terms are relative, for what is the summer solstice in the northern is the winter solstice in the southern hemisphere, and what is the winter solstice in the northern is the summer solstice in the southern hemisphere.

Solstitial Colure. The hour-circle which passes through the solstitial points. See COLURES.

Solstitial Points. The two points of the ecliptic at the greatest distance from the equinoctial. They are distinguished as the *summer solstitial point* and the *winter solstitial point*, and called also the *first point of Cancer* and the *first point of Capricorn*, as being the commencement respectively of these signs of the ecliptic. They are represented by the symbols of these signs, ♋ and ♑. The figure of the *Crab* (Cancer) has evident reference to the sideways and backward motion of the sun at this point of his orbit. The solstitial points, like the equinoctial points, do not preserve a constant place among the stars, but have a slow retrograde motion.

Soma. A Japanese junk.

Song. The chant used by merchant sailors in hauling. The call formerly used by the leadsman in giving the soundings obtained. See NAVAL SONGS.

Son-of-a-gun. Originally, a boy born afloat. A term of slight contempt.

Sops (*Eng.*). Detached clouds hanging about mountain tops.

Sothis. The Egyptian name for the star *α Canis Majoris*. See SIRIUS.

Sou'. A colloquial abbreviation for *south*.

Sough. The sighing or hollow sound made by the wind, especially before a gale.

Sound. A cuttle-fish. The swimming-bladder of a fish. To measure the height of the water in the pump-well. To measure the depth of water in the sea, by means of a line and weight, or by some machine devised for the purpose. See DEEP-SEA SOUNDING, LEAD. A whale *sounds* when it dives upon being struck with a harpoon.

Narrow passes which connect larger bodies of water receive many designations. Among these, *sound* is used to designate some, but far more are called *strait*. The three terms, *strait*, *channel*, and *sound*, are interchangeably used to name such passes. Besides these, in many places, the word *passage* is used. Some straits are called *belts* in the Baltic, *firths* in the Scottish isles, and *pertuis* on the French coast. The words *canal* and *canale*, in Italy and Austria, designate sounds and straits. A sound or a channel is supposed to be larger than a strait or passage, but such is not always the case.

Great numbers of these water-passes exist, straits being the more numerous, and sounds next, while channels and passages are not far behind.

The principal sounds and straits of Europe are those connecting the Baltic with the North Sea, the latter and the Irish and Mediterranean Seas with the ocean, and the various seas and gulfs of the Mediterranean basin with the ocean, or with each other. The Baltic waters find their way out through a succession of passages, called in succession Skager Rack for 150 miles, Kattegat for 120 miles, and the Sound 26 miles. The smaller passages about the Danish islands are named belts, the chief being the Great Belt, Little Belt, Langeland Belt, and Fehmern Belt. In the Baltic itself are Kalmar Sound, and several small passes.

The North Sea connects with the English Channel by the Strait of Dover. The two passages are 270 miles long, and from 45 to 18 miles wide. The Irish Sea connects with the Atlantic through St. Patrick's and the North Channel, and through St. George's Channel. These are wide sounds, and there are innumerable passages, sounds, etc., among the many islands of this sea.

The Strait of Gibraltar connects the Mediterranean with the Atlantic, and the other principal straits of this sea are Bonifaccio, Messina, Otranto, and the Dardanelles and Hellespont Channels, through which the various seas connect with the larger Mediterranean. The passages separating the Ionian isles are generally called channels, and are narrow and deep.

Asia is separated from America by Behring's Strait, connecting the Pacific and Arctic Oceans. The numerous seas that indent the Asiatic coast are connected with one another and with the ocean by passages, channels, straits, and sounds innumerable, chief of which are La Perouse Strait, Corean, Fo-Kien, Balintang, and Bashee Channels, Malacca Strait, Falk Channel, and the Straits of Ormuz and Bab-el-Mandeb. The islands of Malaysia and Melanasia are separated by similarly-named passages, the largest of which are Macassar, Sunda, Torres, and Bass Straits, and Gilolo, Molucca, and Pitt Passages.

The Mozambique Channel, on the African coast, is one of the largest sounds. It is 1000 miles long, and from 240 to 480 wide.

The many islands in the Frozen Sea, north of America, are separated by straits, sounds, and channels, named to perpetuate the memories of their discoverers or their countries' sovereigns, cities, or great men. Davis and Hudson's Straits and Melville Sound are the largest. Here we also find sounds that are really bays,—Albert, Kotzebue, and Norton Sound being such bodies of water. On the coast of the United States are many shallow sounds, and in the West Indies are large channels and passages. On the southern coast of South America are numerous straits and channels, the largest being the Strait of Magellan.—*F. S. Bassett, Lieutenant U.S.N.*

SOUND-DUES. Tolls formerly levied on all shipping passing into the Baltic Seas.

SOUNDING-LEAD. See LEAD.

SOUNDING-LINE. A lead-line.

SOUNDING-MACHINE. Several machines have been invented to facilitate sounding. *Massey's lead* measures the depth by the revolution of a fan, set in an ordinary lead, with counter-wheels attached. *Walker's harpoon sounding-machine* is on the same principle. The *self-registering lead* was invented to measure the depth by the compression of the air contained in a tube, and several modifications, Ericsson's among others, have been made, but none are in general use. *Trowbridge's electric sounding apparatus* has a line coiled in a small cylinder, with a wire inside the line. When the lead strikes the bottom, the circuit is completed, and announced on deck. It is not successful.

Sigsbee's Sounding-machine.—Slightly in ad-

vance of the reel, which is practically the same as that in the Thomson apparatus, are two pipes parallel to each other and about 6 feet in height, each containing a spiral extension spring fastened at the bottom and connecting, by means of ropes taken over pulleys at the top of the pipes, with a cross-head moving between the two pipes, the latter serving as guides. The cross-head contains a pulley, one yard in circumference, over which the wire leads in its passage from the reel to the water. The normal position of the cross-head is at the top of its guides, and it can be borne down only against the resistance of the springs. By this means a very sensitive accumulator is provided to ease the jerks on the wire while reeling in, and which also shows, by a graduated scale on the pipes, the amount of strain upon the wire at all times during the same operation, thus acting as a dynamometer. An odometer attached to the axle of the cross-head pulley gives without reduction the number of yards of wire payed out or reeled in.

In paying out no weights are used for tightening the friction-line, but the latter is connected with the cross-head in such a manner that the resistance of the springs is made available for the purpose stated. This arrangement also operates as an automatic governor on the motion of the reel when paying out wire in a sea-way. During the downward plunges of the vessel, when the strain upon the wire is suddenly eased, the operation of the governor is to increase the strain on the friction-line, slowing down the reel and preventing the wire flying from the drum. As the decreased speed of the reel or the rising of the vessel restores the tension upon the wire the friction-line is eased in turn, and the reel permitted to revolve more rapidly. At the instant when the sinker strikes bottom the governor automatically increases the resistance upon the reel. There are various accessories to facilitate operations and to insure the safety of the wire. The machine as now constructed is almost entirely of steel, and has a small steam-engine attached. The apparatus folds in such a way that the whole may be stowed in a box of small dimensions.

Sir William Thomson's Sounding-machine.— This machine is designed for the purpose of ascertaining accurately and quickly the depth of water under a ship, without stopping or even reducing her speed.

The apparatus consists of a light wheel on which is coiled about 300 fathoms of piano-forte steel wire. The stand to which the supports of the wheel are attached is fixed to the taffrail, at the stern of the vessel, so that the sinker can be left hanging ready for a cast. A cord wound round a groove in the circumference of the drum, is so arranged as to form a self-acting brake, which when the sinker is hanging offers enough of resistance to prevent it from running down, but when it is being hauled in offers very little resistance to the turning of the wheel. When the order is given to take a sounding the brake is released by the hand, so as to leave a force of about 7 pounds pulling on the rope, by which a resistance of about 5 pounds is opposed to the wire while it is running out. Thus, when the sinker reaches the bottom the wheel suddenly stops. The brake is then applied to prevent it from running on again.

The sinker is a long iron weight of 22 pounds, with a hollow at the bottom to receive the usual arming of tallow, etc., to bring up a specimen of the bottom. It is attached to the end of the wire by means of a rope 6 or 8 feet long.

A brass tube a little more than 2 feet long is lashed to the rope connecting the sinker with the wire. A glass tube, 2 feet long, coated inside with chromate of silver, and closed at one end and open at the other, is placed with its open end down, in the brass tube. As the sinker descends the increased pressure drives the sea-water up the glass tube, which, combining with the chromate of silver, makes a white mark. The height of the white mark registers the height to which the liquor has been forced up the tube. A scale, graduated to fathoms, shows at once the depth to which the glass tube has been. This method of taking soundings depends on the increased pressure as the tube descends, but is independent of the amount of line out, so that the vessel does not require to be stopped in order to take a sounding.

The advantages of wire over rope of the same strength, are the smallness of area and smoothness of surface, on account of which it experiences very little resistance when pulled rapidly through water. This allows the sinker to descend very quickly, and to be hauled on board again with great ease, so that two men working the machine can take soundings in 100 fathoms every few minutes, from a ship running at any speed, up to 16 or 17 knots.

When the machine is not required for immediate use, the drum must be kept in the iron tank covered with lime-water.

Sounding-pole. A pole used in sounding by small craft in rivers. They are represented in Egyptian wall-paintings of 1800 B.C.

Sounding-rod. A rod, marked in feet and inches, and suspended by a line, used to sound the pump.

Soundings. The depth of water ascertained by the lead. *On soundings*, within the 80-fathom line. Soundings are expressed in fathoms on charts, except in French charts, where metres are used. See Fathom, Deep-sea Sounding.

Souse. To immerse suddenly in a fluid.

Soused-gurnet (*Eng.*). A pickled fish.

South. The region, and the point of the compass, directly opposite to the north. All Teutonic and Latin races use the same word, except Italians, who call it *Ostro*.

Southampton. A seaport town of England, on a peninsula at the mouth of the Itchen, near the head of Southampton Water. Lat. 50° 44′ N.; lon. 1° 24′ 2″ W. The manufactures, except ship-building, which is carried on to a large extent, are chiefly confined to brewing, coaches, castings, silk goods, carpets, and the refining of sugar. The town is a very important steam-packet station, and is much visited by ocean-steamers. It has very fine docks, and is an emigrant station. Pop. 54,000.

South-easter. A southeasterly gale is generally wet on the American coast, but dry and hot in the Mediterranean.

Southing. The distance in nautical miles which a ship makes to the southward.

South-wester. A southwesterly gale, accompanied by rain on the American and English coasts. A storm-hat of painted canvas, oiled

cloth, silk, or rubber, with broad brim or flaps to protect the neck.

Spain, Navy of. The discovery of the New World by Christopher Columbus naturally led the government of Spain to extend the desire for exploration and possession in the southern parts of the western hemisphere. This necessitated the construction of more ships for purposes of traffic and travel; and in anticipation of the hostility of other nations possessing like maritime resources, and inspired by the same designs, a navy became ultimately necessary. The 16th century, however, had seen eight decades before any very decided steps were taken to give employment to the armament which Philip II. had devoted so much time and treasure to raise. In 1587, after several contests with the Dutch in the great War of Religion, the king of Spain had at command a force of 130 magnificent ships of war, well manned and equipped, and with these he determined to make a descent upon England, with the avowed purpose of taking possession of the country and punishing and converting the heretics. The "Invincible Armada" was the pompous title given to the hostile expedition. It left the Spanish coast, under the command of Admiral Medina Sidonia, in the summer of 1588, a year later than was intended, but Admiral Drake had, in the interval, crossed to the Spanish coast and destroyed 100 vessels laden with stores of war, besides intercepting and capturing a large treasure-ship. After a few skirmishes and isolated combats on the passage, the Armada was confronted by an English fleet on the 8th of August. The great height and tonnage of the Spanish ships making them rather unmanageable when evolutions were attempted, conspired to place them at a disadvantage in the great battle that ensued. After a combat, which lasted an entire day, as many of the Spanish men-of-war as had not been crippled or captured sailed away in a northerly direction to avoid the Dutch and English cruisers in the Channel. In the North Sea they experienced a heavy storm, which shattered so great a number that, on the arrival of the remnant of the Armada in the harbors of Spain, scarcely one that had escaped was entirely uninjured. But the enormous wealth of the nation, arising out of its possessions in the Indies, enabled it rapidly to recover from its disasters, and during the two centuries that ensued Spain held her own, now against England and France, now associated with the latter power. Ultimately, however, the naval forces of her antagonists prevailed, and as the loss of her foreign possessions, either through wars or rebellions, reduced her resources and limited the field for the employment of her ships, she gradually declined as a naval power, and her navy is now represented by 11 armor-clad vessels, 9 wooden screw-frigates, 10 screw-corvettes, 10 paddle-wheel corvettes, 2 avisos, 75 gunboats, 17 other steamers, and 4 sailing-vessels, a total of 138. None of her fighting-ships possess either the armor, speed, or armament to compare with lately constructed armor-clads. The "Numancia" and the "Vitoria" are the most powerful of the armored ships. They are rated as line-of-battle ships, have broadside batteries and ram bow, and are built of iron. Both of the above vessels are of the same general dimensions; the principal difference is in the armor and armament. The "Numancia's" plates are 5 inches thick at the water-line, and she carries six 18-ton guns, three 9-ton, and sixteen 7-ton, all Armstrong rifles; the "Vitoria's" armor is 5½ inches thick at the water-line, and her armament consists of four 12-ton, three 9-ton, and twelve 7-ton Armstrong guns. The minister of marine is invariably chosen from the grades of vice- or rear-admiral, having two sub-secretaries (rear-admirals). The corps and grade divisions of the active *personnel* correspond with those of other nations, the grades of the executive corps being as follows:

Almirante, vice-almirante, gefe de escuadra, capitan de navio, capitan de fregata, teniente de navio (1a cl., 2a cl.), alfarece de navio, guardia marina.

The grades of the medical corps are medical inspector, medical sub-inspector, surgeon-major, first surgeon, second surgeon.

The grades of the commissary corps are superintendent, purveyor (1st class, 2d class), commissary (1st class, 2d class), first assistant commissary, second assistant commissary, third assistant commissary, supernumeraries.

Chaplains have their grade and rank also. Sub-vicar-general, first chaplain, second chaplain, sacristan (lay official), chorister (lay official).

The technical corps includes the ship and engine constructors, and have the grades of general officer, brigadier, ship-of-the-line captain, frigate captain, lieutenant, ensign.

The corps of machinists who work the engines are graded as first, second, third, fourth, and assistant machinists. The total active *personnel* of the fleet is 1792 officers (exclusive of chaplains, midshipmen, and the technical corps). There is also a marine artillery corps, the officers of which are 1 general officer, 3 colonels, 7 lieutenant-colonels, 16 captains, 20 lieutenants, and the marine infantry corps, which is divided into 2 half brigades of 2 battalions each, and 2 companies of native infantry in the Philippines. The strength of this corps is 170 officers and 6256 men, making a grand total of 1962 officers and 20,256 men in the Spanish navy. The Naval Academy at Ferrol furnishes all the officers of the executive corps of the service. There are also special schools under naval control for the education of pilots of the merchant service, one for machinists, and an academy for the artillery and technical corps. The Hydrographic Bureau and Naval Museum are located at Madrid, and the Naval Observatory at San Fernando. The annual expenditure for the navy is a little over $5,000,000.

Spake-net. A net for catching crabs.

Spalding-knife. A Newfoundland knife for splitting fish.

Spaldings (*Eng.*). Whitings and other small fish.

Spales, or Spaling. Cross-bands placed so as to keep the frames of a wooden or iron ship in place until beams, planking, or plating are put on.

Span. A rope having both ends made fast, so that a purchase may be hooked in the bight. A rope made fast to a stay or shroud in the centre, so that both ends may be used. To connect by ropes. *To span in the rigging*, to draw the topmast rigging together by tackles; to seize on the

catharpin-legs. Span of the rigging, the distance over the mast-head, from the dead-eye on one side to that on the other. *Spanning a harpoon*, fixing the harpoon-line to it. The staff ships in an iron socket, but is not fast, and the line runs through a becket on the staff, and through the socket, making fast to the head of the harpoon. The staff disconnects on striking, but is retained by the line.

SPAN-BLOCKS. Blocks seized into each bight of a strap that leads across a cap or mast-head, so as to hang down on either side.

SPAN-LASHING. The lashing of a span, or a lashing that spans the distance between two ropes separated by a slight interval.

SPAN-SHACKLE (*Eng.*). A large bolt through the forecastle deck, with a triangular shackle in the head to receive the heel of the old-fashioned fish-davit. Bolts driven in the deck, by which the spars and boom-boats are lashed in place.

Spanish-burn (*Eng.*). Hiding defects in timber by hacking it with an ax.

Spanish-burton. A kind of purchase. A *single Spanish-burton* has two single blocks, the upper, the standing block, with a tail or hook to it, the lower having the standing end of the fall made fast to its strap. The weight is applied to the bight of the fall between these blocks by means of a hook. *Double Spanish-burtons* have three blocks, all single or one double, two blocks being movable and one fixed, and the weight is applied to the lower of these. The fall is in two parts,—one secured to the strap of the leading block, and the other to the lower block, or to the upper one. The increase of power is from 3 to 5 times that applied.

Spanish-fox. A single yarn twisted up left-handed, or contrary to its lay.

Spanish Mackerel. The tunny-fish.

Spanish Reef. The yards are lowered on the cap, but the reef-tackles are not hauled out, as in a *monkey-reef*. A knot tied in the head of a jib.

Spanish Windlass. A wooden roller, with a rope wound about it, into which a marling-spike is thrust to serve as a lever. A purchase formed by several turns of a rope around two parts of a piece of rigging, both ends being hauled upon.

Spanker. The aftermost sail in a ship; a fore-and-aft sail, setting abaft the mizzen-mast, having a gaff, and generally a boom. Formerly called the *driver*. Until the middle of the last century a lateen-sail was used instead of the spanker. For the rigging of a spanker, see under the proper heads.

Spanker-eel (*Eng.*). The lamprey.

Spanking. Large; fine; strong. *A spanking breeze*, a fine, fresh breeze. *A spanking frigate*, a large, fine frigate. *To go a spanking*, to sail with a fine breeze aft, or quartering.

Spanner. A wrench fitted to gripe and turn a cylindrical piece; as, a *hose-spanner* or wrench with which hose-couplings are manipulated.

Spar. Any round piece of timber used for a mast, yard, boom, etc. *A shifting spar* is a light spar, with a hook or a grommet attached, used to shift a light gun from one carriage to another. *A torpedo-spar* is one used to thrust a torpedo from a ship's side or bow. *Spare spars*, see SPARE.

SPAR-DECK. See DECK.

SPAR-MAKER. A carpenter whose especial trade is the fabrication of ships' masts, yards, etc.

SPAR-PILE. The collection of spare spars on the deck. The locality is called the *booms*.

SPAR-SHED. A shed or shop in a navy-yard where spars are fashioned.

SPAR-TORPEDO. See TORPEDO.

Spare. A general term for all reserve stores put on board ship, as spare sails, spare spars, etc.

SPARE ARTICLES. Duplicate sets of small castings, etc., placed under the care of the yeoman. Also, extra sets of gear for the service of the guns issued to each division, such as sponges, breechings, trucks, etc.

SPARE ANCHOR. An additional anchor, the size of the bower, formerly furnished to ships. It is now replaced by one of the sheet-anchors.

SPARE SPARS. Certain spars furnished in duplicate. These are fore- and main-topmasts, fore-yard, fore- and main-topsail yard, topgallant and royal yards, and studding-sail booms. Spare spars are not furnished so liberally to steamers, not being so essential to their safety. They are placed in the *spar-pile*, or on cranes in the channels on either side.

Sparling. The *smelt*.

Sparoid. Belonging to a family of spinous-finned fishes, which include the gilt-head, sea-bream, and porgee.

Spat. The spawn of the oyster.

Speak. *To speak a vessel*, to pass within hail and communicate with a ship by voice.

Speaking-trumpet. See TRUMPET.

Specific Gravity. See GRAVITY.

Speck. The blubber of whales.

SPECK-BLOCK. The block through which the *speck-falls* are rove.

SPECK-FALLS. Ropes rove through the speck-blocks, at the mast-head of a whaler, and connected to the *blubber-guy*; used for hoisting the blubber strips.

SPECKTIONEER. The chief harpooner, who also superintends cutting and stripping the blubber.

Speed of Ships. Ships under sail make from 5 to 15 miles an hour, with good breezes. Their speed varies much with the direction of the wind, its force, and the state of the sea. Ships sail slower close-hauled than when free, and better with a side wind than when it is aft. The average rate of sailing is about 120 miles per day. Clipper-ships have far surpassed this, and the "Sovereign of the Seas" averaged 19 miles an hour in a trip to San Francisco. Yachts have made nearly as much, and greater speed has been attained by sailing-catamarans. The speed of steam-vessels is gradually increasing. Two hundred miles a day is thought to be a fair average, but steamers make as much as 20 or 22 miles an hour. Some boats have made 25 miles, and even more, in smooth water. An average speed of 10 knots is thought no longer to suffice, and men-of-war should be able to steam 15 miles in a moderate sea.

Speed-indicator. A log, fixed on the taffrail or at the stem, so that the speed of the vessel is at any time ascertained by looking at it. See LOG.

Spell. A short period employed in work. A relief or temporary respite from labor. A spell at the wheel is called a *trick*. *Spell ho!* a call for a relief. *To spell*, to relieve at any work for a short time.

Spencer. A trapezoidal sail setting on a mast

and gaff, without a boom, invented by Knight Spencer, in England, in 1802. *Fore-spencer*, the fore-trysail. *Main-spencer*, the main-trysail. For the gear of a spencer, see under proper heads.

SPENCER-MAST. A trysail-mast, stepped abaft the principal mast.

Spent. Having lost power; as, a *spent shot*, a *spent mast*, etc.

Sperm-whale, or Spermaceti-whale. A large, square-nosed whale, the *Physeter macrocephalus*, or cachalot, of the Delphinoid or toothed order of Cetaceans. It is found in tropical and temperate seas, and its oil is very valuable. It attains a length of from 60 to 80 feet, the head, containing the oil, being a third of this length. See CACHALOT.

Speronare. An Italian boat, having two masts with lateen-sails, the foremost raking forward.

Spew Oakum. The seams are said to *spew oakum* when, from heat or working, the oakum starts from between the plank.

Sphera Nautica. A navigating instrument used in 1570.

Spherical-case. See SHRAPNEL.

Spica (*Lat.* an ear of corn). The name of the bright star *a Virginis*, so called after the device of the ancient Greeks, who placed an ear of corn in the hand of the Virgin, typical of the harvest, which with them coincided with the sun's approach to this conspicuous star. See VIRGO.

Spider. An iron outrigger, to keep a block clear of the ship's side, of the funnel, etc.

Spider-band, or Spider-hoop. An iron band around the lower mast, to which the futtock-shrouds are attached by hooks inserted in eye-bolts in the band. A band around a mast, with sockets attached, into which belaying-pins are thrust.

Spider-crab. The sea-spider.

Spike. To drive spikes in plank or timbers. To close the vent of a gun by driving a steel spike into it. A cut or wrought nail, larger than 10d, used in boat- and ship-building. *Boat-spikes* are from 3 to 10 inches long, and there are from 2 to 17 of them to the pound. *Ship-spikes* are stouter, from 4 to 10 inches long, and there are from 1 to 8 in a pound. A round steel file or rod, used to close the vent of a gun. *Spring-spikes* have a spring at the lower end, to retain them in place. A handspike.

Spike-plank. A bridge across the deck of Arctic vessels.

Spike-tackle. The tackle used by whalers to hold the whale alongside while stripping it.

Spike-tub. A tub receiving the fat, blubber, etc., of whales, until it is rendered.

Spile. A pin driven in a nail-hole. A pile. A spigot. A wooden peg in a small hole in a cask containing a liquid.

SPILE-HOLE. An air-hole in a cask. A hole for a spigot.

Spiling. The edge curve of plank or timber. Taking the shape from a curved surface, as a ship's side, by the use of a straight batten and a rule, and applying the same to a plank which is to be bent to the shape taken off.

Spill. To take the wind out of a sail by bracing the yard, by hauling up some of the gear, or by luffing the ship.

SPILLING-LINES. Ropes sometimes temporarily fitted to the courses, extending abaft the sail to the leeches, for the purpose of spilling the wind out of the sails.

Spindle. The upper main piece of a made mast. The shaft on which the capstan revolves. The stem or axis of a vane.

Spindle-valve. A disk-shaped valve which is moved and guided to and from its seat by a *spindle* or *stem*; as, in *stop-valves*, *poppet-valves*, etc.

Spingard. An old cannon.

Spire-vapor. Spiral streams of vapor rising from the surface of the ocean, seen in Arctic regions.

Spirit-ration. The ration of grog, formerly served out to the crews of our ships, and still given in some navies. It was abolished in the U. S. navy in 1862, and five cents a day is paid each man as a commutation.

Spirit-room. The room in the hold where spirits were formerly kept, under sentry's guard. It was abaft the main hold, and forward of the after-peak, and, where yet existing, is used for paymaster's stores.

Spirket. A space forward and aft, between the floor-timbers.

Spirketing. That part of the inside planking in vessels of war which is worked between the top of the water-ways and the lower port-sills. Where there are no water-ways, it is the thick strake wrought on the top side of the beams.

Spit. A narrow tongue of land or shoal. A light rain-squall. A narrow tongue of land or a shoal making out into the sea.

Spit-fire Jib. A small storm-jib used in cutters.

Spithead Nightingales (*Eng.*). Boatswains and boatswains' mates, piping their calls.

Spit-kid. A small wooden cask, set about the decks, for spit-boxes. Spitting upon decks is an unpardonable offense, and men are sometimes punished by serving as perambulating stands for spit-kids.

Spla-boards (*Eng.*). Plank fixed at an angle, to reflect light into magazines.

Splice. To unite two ropes, or to join a rope to a chain, by interweaving them. The union of two ropes, or of a rope and chain. Two ropes joined to reeve through a block are united by a *long splice*, in which the strands of each rope are replaced by those of the opposite rope, and the ends are neatly tucked under other strands. A *short splice* is made where a large diameter is not objectionable. The ends of the strands are tucked under those of the opposite rope two or three times. An *eye-splice* is one in which an eye is formed in a rope, the end being spliced into its own part. A *cut-splice* is an oval formed by splicing the ends of two ropes into the opposite rope, at 6 or 8 inches from the end. A *horseshoe-splice* is made by splicing a short piece of rope between the parts of a bight formed in a rope. A *sailmaker's splice* is one joining two ropes of different sizes, so that the splice is tapered. A *mariner's splice* is simply a long splice in cable-laid rope. A *drawing splice* is one made without tucking the ends, so that it may be drawn out. Ropes are spliced to chain, and wire ropes are spliced together by peculiar methods, and rope is spliced around thimbles and bull's-eyes.

SPLICED EYE. An eye spliced in the end of a rope. A thimble or bull's-eye is generally inserted in it.

SPLICING-FID. A tapered wooden fid, used to

open the strands of a rope. Marline-spikes are oftener used for splicing.

SPLICING-SHACKLE. A large shackle in the end of a chain, with a thimble for splicing a rope to it.

SPLICING THE MAIN BRACE. An expression denoting the act of drinking spirits. It is equivalent to "topping up the boom," and "sweating up the halliards." The Germans say "*Besahnshot an!*" "Haul aft the spanker-sheet!"

Splinter. A fragment of wood or iron broken off by the passage of a shot through a ship.

SPLINTER-NETTING. A netting formed of light rope, to prevent accidents from splinters, falling spars, etc.

Splitter. The fisherman who splits fish open after they have been *headed*.

Splitting-out. Splitting away the wedges from under a vessel's keel before launching.

Splitting the Books (*Eng.*). Opening a new set of books after paying off, in which men are continued with their old numbers.

Spoke. One of the projecting handles of the steering-wheel. "*To put a spoke into a man's wheel*" is to say a good word for him.

Sponge. A fibrous and porous substance from the sea-depths, the framework of a marine animal. An instrument for cleansing the bore of a gun. The ordinary sponge consists of the handle or staff, and a wooden head covered with alum-dressed sheepskin, and having a small spiral in the end, to bring out pieces of cloth. A *rope-sponge* has no handle, but merely a piece of rope. A *bristle-sponge*, used in rifle-guns, has, instead of sheepskin, stiff bristles, disposed in spiral strips, or straight sections, on the sponge-head. A *sectional sponge* is one whose handle is in sections, for easier manipulation in a turret. A *sponge-and-rammer* is furnished to boat-howitzers, having one of these instruments on each end of the staff. A *valve-sponge* has in the end a valve opening by pressure, allowing water to escape, and thus washing the bore. It is used in very heavy guns. *To sponge*, to clean the bore with a sponge. In some modern ships, this is done from the deck below, by depressing the gun, machinery working the sponge.

SPONGE-CAP. A canvas bag, fitted over the head of a sponge when not in use.

SPONGE-COVER. The sheepskin nailed over the head of a sponge.

SPONGE-FISHING. Sponges are procured in Grecian, Syrian, and Italian waters, and coarser varieties in the West Indian seas. They are procured by diving after them, by spearing them with a long spear from a boat, and by dredging after them. Sponges abound in the Mediterranean.

SPONGE-HANDLE, or SPONGE-STAFF. The wooden staff serving to thrust the sponge to the bottom of the bore. It is often in sections, screwed together.

SPONGE-HEAD. The wooden head attached to the sponge-staff.

Sponson. The space forward and abaft the paddle-boxes of river-steamers to increase their stability. Sponsons are made sometimes open and sometimes closed, depending upon the roughness of the water into which the vessel is to run.

SPONSON-BEAM. A projecting beam in river-steamers uniting the paddle-box with the ship's side.

SPONSON-RIM. The wale upon which the paddle-beam rests at the ship's side.

Spoon, or Spoom. To scud under bare poles.

Spoon-drift. The fine mist blown from the top of the waves, and filling the air with mist. Driving snow at sea.

SPOUT-FISH. Any marine animal that spouts, as whales, etc.

Spotts, James H., Commodore U.S.N. Appointed midshipman, August 2, 1837; made a cruise around the world in the "John Adams," 1837–40; engaged in two battles on the island of Sumatra, in 1839; in the "Delaware" and "Potomac," on the Brazil Station, 1841–42.

Promoted to passed midshipman, June 29, 1843; cruised in the "St. Lawrence," in the West Indies, in 1843, and in the "Falmouth" and "Southampton," on the coasts of Mexico and Africa, in 1844–45.

Promoted to master, April 8, 1851, and commissioned as lieutenant in November of the same year. He was on the Pacific coast, in the "Lexington," in 1846–49, and again, in the "Portsmouth," in 1851–55. During the Mexican war he was on blockade duty on the west coast of Mexico, and participated in the capture of Mazatlan, San Blas, Lapaz, etc.; in the "Michigan," 1856–58; "Cyane" and "Saranac," Pacific coast, 1858–60; "Santee," Gulf Squadron, 1861; commanded "Wanderer," Gulf Squadron, 1861–62, and the "Magnolia," in the latter part of 1862.

Commissioned as commander, July 16, 1862, and commanded the "South Carolina" in 1863; commanded the "Pawtuxet" in 1864–65; executive-officer of the Mare Island Navy-Yard, 1865–67.

Commissioned as captain, July 25, 1866; commanded the "Saranac," on the Pacific coast, in 1870–71, and the "Pensacola" in 1871–72; light-house inspector, Pacific coast, 1872–74.

Commissioned as commodore, September 25, 1873; inspector of government vessels on the Pacific coast, 1877–80. During the war of the Rebellion served in the Gulf, North and South Atlantic Squadrons on blockade duty; was in both engagements at Fort Fisher, and all the batteries on Cape Fear River up to Wilmington, and several minor engagements whilst on blockade duty during the war; was up the James River when Richmond was captured.

Spout. Whales are obliged to rise to the surface and spout at intervals varying from 10 to 15 minutes. See BLOW, WATER-SPOUT.

Sprat. A small fish (the *Clupea sprattus*), allied to the herring.

SPRAT-WEATHER. Dark days in November and December, favorable for fishing for sprats.

Spray. Water flying in small drops or particles, as from the top of a breaking wave.

SPRAY-BOARD. A strip on the gunwale of a boat to keep the water and spray from coming in.

Spread-eagle. To make a spread-eagle of a person is to lash him in the rigging with hands and feet outspread. If the topmen can get a passenger or new-comer aloft, he is thus made to pay a forfeit.

Sprig, or Sprig-bolt. A small eye-bolt with a ragged point.

Spring. A crack in a spar, rendering it de-

fective. A hawser, run out from any part of the ship to a point on shore, a buoy, etc., to turn or *spring* the vessel. A hawser, leading from the stern outside the ship, to the cable by which the ship is anchored, so as to spring her in action, or for any other purpose. To split or strain a spar. To turn a ship by means of a spring. *To spring a butt*, to start the end of a plank from its fastenings. *To spring a leak*, to begin to leak. *To spring the luff*, to luff up into the wind, so as to shake the sails slightly, and then to fill away again. *Spring of a beam*, the curve upward of a beam from a level or horizontal line,—generally from 4 to 6 inches in 40 feet.

Spring-balance Valve. A valve which is held to its seat and adjusted to a given pressure by a spring-balance; as, the safety-valves of locomotive-engines, etc.

Spring-beam. A fore-and-aft beam connecting the paddle-beams, at their outer ends.

Spring-block. A block, connected to a ring-bolt by a spring, used on tacks and sheets, for greater elasticity. Invented by Hopkinson.

Spring-forelock. A *forelock*, formed of a piece of steel bent double, so as to spring open, and keep its place.

Spring-rowlock. A rowlock, fastened in place by a spring.

Spring-searcher. A steel pronged tool to search for defects in the bore of a gun.

Spring-spike. A spike for a gun, with a spring at the lower end to prevent its withdrawal.

Spring-stay. A duplicate stay, placed apart from the main one, to serve as a substitute for it in case of injury by shot, etc.

Spring-tides (Sax. *springan*, to grow, bulge). The greatest tides, taking place after the syzygy of the sun and moon. See TIDES.

Sprit. A small spar crossing a sail diagonally from the tack to the peak, and resting in a becket at the mast, called a *snotter*. The supporting spar, or belly-spar of a pair of sheers.

SPRITSAIL. A sail formerly suspended under the bowsprit, from the *spritsail-yard*. A boat's sail, extended by a *sprit*, quadrilateral in shape.

SPRITSAIL-GAFFS. A name for the *whiskers*.

SPRITSAIL-SHEET KNOT. A knot formerly used on the spritsail-sheet, made by walling and crowning the six strands together, forming an eye or short bight, to which the sheet was bent.

SPRITSAIL-TOPGALLANT-SAIL. A sail formerly set on the flying jib-boom in the same manner as the spritsail-topsail on the jib-boom.

SPRITSAIL-TOPSAIL. A sail above the spritsail, bent to a yard hanging under the jib-boom.

SPRITSAIL-YARD. A yard formerly suspended under the bowsprit near the cap, to which the spritsail was bent. It had lifts reaching to the *cap*, and braces coming in on the forecastle, and was trussed to the bowsprit. This yard is replaced by the *whiskers* in modern vessels.

SPRITSAIL-YARDING. Thrusting a stick through the gills of sharks, etc., and turning them loose thus.

Spruce-head. See SINKING-HEAD.

Spud. A potato.

Spun (*Eng.*). Bilged, or turned back; rejected in an examination.

Spun-yarn. Small-stuff, formed by twisting together two or three old rope-yarns by a winch. See SMALL-STUFF.

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Spur. A projecting spar. A spur-beam. A spur-shore. A projection on the bows of a ram.

SPUR-BEAM. A curved timber serving as a half-beam to support a deck, abreast of the hatchways.

SPUR-SHORES. Long timbers resting on the launching-ways, with their upper ends bolted to the ship's side.

SPUR-TUBE. See PRIMER.

Spurket. See SPIRKET.

Spurling-line. A line wound over the prolongation of the axis of the steering-wheel, and connected to the tell-tale, by means of which the needle followed the motions of the wheel. A line formerly lashed to standing-rigging, with several branches holding thimbles or fair-leaders for running-gear.

Spurn-water. The water-ways. A channel left above the ends of the deck-plank, to prevent the water from going farther.

Spy-boat. A picket-boat, or look-out boat.

Spy-glass. A small telescope for ship or field use.

Squadron. A detachment of vessels or boats employed on any particular service. The divisions of a fleet, as van, centre, and rear. Any assemblage of vessels smaller than a fleet. The fleets of the U. S. navy in various parts of the globe are sometimes called squadrons, as the European Squadron, etc. See NAVAL TACTICS.

SQUADRON, FLYING. A squadron of observation or practice, that cruises rapidly about from place to place.

Squall. A sudden and violent gust of wind, of greater or less duration. These are frequent in some localities and at some seasons, and are particularly dangerous near high land. They are generally preceded, accompanied, or followed by clouds, which, together with the indications of the barometer, serve as a warning of their approach. *White-caps* on the surface of the sea also aid the mariner in foreseeing them. As the clouds are heavy and thick, or light and thin, so, generally, will be the character of these squalls; and the character of the cloud, whether rapidly rising and flying about, or quiescent and slowly changing, also foretells more or less wind. Rain, or snow, attends many of these squalls. *A black squall* is dark and threatening, and generally attended with rain. *A heavy squall* is one attended with much wind. *A white squall* is a furious blow, generally met with on the African coast, unannounced by signs other than the white-caps, and by a rushing sound, attended by a thin, whitish haze. Rain generally accompanies it. As regards the management of a vessel in a squall, the practice of seamen differs, some luffing her up and shaking the sails until the squall has passed, or sail has been reduced, and some putting the helm up and running before the wind; which to do would depend somewhat upon the ship, the circumstances, crew, etc., but generally speaking it is more seamanlike, more general usage, and more rational to luff with a wind forward of the beam, and to bear up with a wind abaft the beam. Sail should be reduced in heavy squalls, before it comes if possible, and too great attention to the warnings cannot be paid.

SQUALLY WEATHER. Weather in which squalls are frequent.

Square. The position of the yards when horizontal and at right angles to the keel. A gen-

eral term, signifying level, flush, or in a line with any object. That part of an anchor-shank just at the stock, extending to its upper end. A very long yard, giving great breadth to the sails. To place the frames across the keel at right angles. To place the yards at right angles to the keel and horizontal. *To square the dead-eyes*, to get them in the same horizontal line. *To square the ratlines*, to get them horizontal and parallel to each other.

SQUARE-BODY. The square body comprises all those frames that are square to the centre line of the ship.

SQUARE-BUILT. With the square frames much of the same length, and with short bow and stern.

SQUARE-BUTTED. A yard-arm of a large diameter and square at the end, so as to cut a sheave-hole without detriment to the yard, is *square-butted.*

SQUARE-FORESAIL. A course, or foresail bent to the fore-yard. The monkey-foresail, or square-sail set on the yard of a sloop or schooner.

SQUARE-FRAMES. Frames square with the keel, or at right angles to it.

SQUARE IN THE HEAD, or SQUARE-BOWED. Bluff and broad in the fore-body.

SQUARE-KNOT. See REEF-KNOT.

SQUARE-MAINSAIL. The sail bent to the main-yard.

SQUARE-MARKS. Marks placed on the lifts and braces, which, when brought to a certain point, indicate that the yards are square.

SQUARE-RIBBONS. Horizontal lines in a ship's plans.

SQUARE-RIGGED. Rigged with yards and square-sails principally, although other sails are used. Having especially long yards. Dressed out in full dress.

SQUARE-SAIL. A four-cornered sail bent to a yard. The foresail of a schooner set on a yard. A cutter's or sloop's sail, boomed out.

SQUARE-SAIL BOOM. A boom, hooked to an eye-bolt in the foremast of a schooner or sloop, used to boom out the square-sail.

SQUARE-STERNED. Having a stern formed by a wing transom nearly straight, so as to give little curve to it.

SQUARE TIMBER. A timber perpendicular to the keel. A timber worked with square edges and no beveling.

SQUARE-TOPSAIL. The topsail of a sloop or schooner, set on a yard.

SQUARE-TOPSAIL YARD. The light yard on the topmast of a schooner or sloop to which a topsail is bent.

SQUARE-TUCK. A stern like a yawl-boat, which is built without counter-timbers, the transom continuing up to the top-height.

SQUARE YARDS. To get the yards horizontal and at right angles to the keel. Figuratively, to settle accounts. In squaring yards, the boatswain and his mates attend, the former going ahead in a boat, and signaling with flags, while his chief mate is on the head-spars, and interprets the signal to the other mates. *Square-yard-men* in the tops attend the lifts, and the remainder, on deck, the braces.

SQUARING-OFF. The trimming off of the projecting edges of the strakes after the vessel is planked.

Squatter. The fluttering of sea-birds on the water.

Squeegee. See SQUILGEE.

Squeteague. A fish (*Labrus squeteague* of Mitchell), found in Long Island Sound; called also *weak-fish.*

Squid. A variety of the cuttle-fish, the *Loligo.*

SQUID-LINE. A fishing-line, baited with squid.

Squilgee. Formerly, a small swab. An instrument for cleaning the water from the decks, composed of a wooden head, having a strip of rubber in a groove in its under part, and a staff attached to it. A lazy, mean fellow. A line with toggles in the end, used in setting a studding-sail. A long line bent to the snorter, in sending down light yards,—generally called a *tripping-line.*

Squirm. The twist in a rope.

Stabber. A pricker; an awl used to pierce holes in canvas.

Stable. See STABILITY.

Stability. That quality in a vessel by which, when she is disturbed by wind or wave, she tends to regain her position of equilibrium. The *moment of stability* is the moment of the couple formed by the weight of the ship and the righting forces.

Stack. A precipitous rock rising out of the sea. A pile of guns, made systematically. The *smoke-stack* (which see).

Stacken-cloud (*Eng.*). Cumulus clouds.

Stade. A station for ships. A landing-place.

Staff. A light pole on which a flag is to be hoisted. *Ensign-staff*, a staff shipped astern for the ensign. *Jack-staff*, a pole stepped on the bowsprit for the jack. A class of nautical instruments of observation. A measuring and spacing rule used in ship-building. *Cutting-down staff*, that on which is marked the heights of the *cutting-down line* from the keel. *A half-breadth staff* has marked on it the half-breadth of each beam. *A height-staff* has on it the height of each frame from the keel to the beams. *A room-and-space staff* has on it the distance between frames. The officers composing the suite of an admiral or commodore, consisting of the senior or fleet-captain, the fleet-paymaster, fleet-surgeon, fleet-engineer, fleet marine officer, secretary, flag-lieutenants, masters, ensigns, and midshipmen, and when separate from any of these, the fleet signal-officer.

Staff-captain (*Eng.*). A captain of the navigating branch of officers in the English navy.

Staff-commander. The second grade of navigating officers in the English navy.

Staff-officer. An officer attached to the personal staff of the commander-in-chief. An officer of the navy not exercising military command. Staff-officers in the U. S. navy are divided into corps, as follows: medical, pay, engineer, constructors, chaplains, civil engineers, secretaries, and professors of mathematics. The medical corps includes the surgeon-general, medical directors, medical inspectors, surgeons, passed assistant surgeons, and assistant surgeons. The pay corps includes the paymaster-general, pay-directors, pay-inspectors, paymasters, passed assistant paymasters, and assistant paymasters. The engineer corps includes the engineer-in-chief, chief engineers, passed assistant engineers, assistant engineers, and cadet engineers.

Staff-surgeon. A title used in the English navy for the senior surgeons. The next rank of medical officers above surgeon.

Stag. A rock rising from the sea.

Stage. A plank platform, or single plank used to support men while working. *Floating stage.* (See FLOATING.) *Hanging stage*, a stage suspended over the ship's side. *Cable-stage*, a platform formerly placed in the hold for cables, hawsers, etc.

Stagger. A ship is said to stagger when she has as much canvas as she will bear, and when she moves heavily in rolling.

Stain. Black staining may be done with logwood, ¼ pound; green copperas, 6 ounces; nutgalls, 8 ounces; vinegar, ½ gallon, applied warm. Or, ½ pound logwood boiled in water, with 1 ounce pearlash, ½ ounce verdigris, and ½ ounce copperas added, then the mixture strained, and ½ pound rusty steel-filings added. Another (ebony-black) is vinegar, ½ pound; extract logwood, 2 pounds; green copperas, ½ pound; China blue, ¼ pound; nut-galls, 2 ounces. Boil over a slow fire, and add ½ pound iron-rust.

Staith. An embankment on a river where vessels are laden. An elevated railway-track extending over the water for loading coal, etc., into a vessel.

Stake. A weir for fish. A strake of plank.

Stake-head. A wooden arm in the stake-post of a rope-walk, containing pins, to keep the strands apart in laying rope.

Stake-post. An upright wooden post, with mortices for stake-heads, in a rope-walk.

Stammareen (*Eng.*). The helmsman's seat in a Shetland boat.

Stamp and Go! An order to quicken the men at the ropes or at the capstan, intended to make them heave together.

Stanch. Strong; tight. *A stanch vessel*, a strong and water-tight ship. See STAUNCH.

Stanchion. An upright support. *Lifting stanchions* are of iron, and may be raised and fastened to the beam above.

Stand. A small rest or support. *Stand of ammunition*, the projectile, cartridge, and sabot. *Stand of arms*, a rifle, bayonet, belt, cartridge-box, etc. *Stand of grape*, one complete assemblage of grape-shot mounted. *To stand*, to resist. *To stand fire*, to receive an enemy's fire without yielding. *Stand for*, to direct the course towards. *Stand in*, to head in toward land. *Stand off*, to direct the course off shore. *Stand on*, to continue in the same course. *Stand off and on*, to direct the ship's head first to seaward, then shoreward. *Stand out*, to leave a harbor and direct the course seaward. *Stand by a rope*, to attend it, ready to lower or ease it off. *Stand by!* An order to be ready to let sails fall together; to oarsmen to be ready; to men in heaving the deep-sea lead, etc. *Stand by the anchor*, to prepare to let the anchor go. *Stand clear of the cable*, an order to warn all, before the anchor is let go, to keep away from the chains. *Stand from under!* A cry to those about decks to beware of objects falling from aloft. *Stand right under!* A facetious observation, meaning to *stand from under.*

Standard. An inverted knee placed above the deck, such as standards at the bitts, etc. Also, a long pole or upright used in building stages around the ship.

Standard Compass. A compass placed where the local deviation affects it least, and to which the other compasses are referred. It is mounted on a ratchet-stand, or on a tripod, and is usually an azimuth compass.

Standard-deals. Pieces of boards of fir or pine, in form and thickness conforming to a certain trade standard.

Standard-knee. An inverted knee fayed on the deck and against the side.

Standing-backstays. Permanent backstays.

Standing-bevel. A bevel at an obtuse angle.

Standing-bowsprit. A bowsprit permanently fixed in place.

Standing-fid. See FID.

Standing-jib. The jib proper.

Standing-masts. The lower masts.

Standing-orders. Orders or regulations constantly in force.

Standing-part. *Of a hook*, that part opposite to the point. *Of a sheet*, *lift*, etc., that part which is secured to the yard, to the side, etc. *Of a tackle*, that part which is made fast to the block, or to any fixed point.

Standing-pull. A pull on a rope without moving, facing towards the running part, and pulling 2 or 3 feet at a *swig.*

Standing-rigging. The rigging that is permanent, and does not serve to move yards, masts, sails, etc.

Standing-stay. The principal stay, as opposed to the *spring-*, or *spare-stay.*

Standing Warrants (*Eng.*). Officers remaining with a ship in ordinary, as the gunner, boatswain, carpenter, and cook.

Standing Water. Stagnant or still water, where there is neither current nor tide.

Stand-pipe. A supply-pipe to the boiler, so far below the level of the outside water that the pressure may overcome the steam-pressure in the boiler.

Stangs. Poles placed across a stream. Eel-spears.

Stanly, Fabius, Rear-Admiral U.S.N. Fabius Stanly, son of the Hon. John Stanly, was born in Newbern, N. C., December 15, 1815. Appointed midshipman, December 20, 1831; served in the frigate "Constellation," Mediterranean, 1832–34; receiving-ship "Hudson," New York, 1835; sloops "Concord" and "Warren," West Indies, 1835–36; bark "Consort," surveying, 1837; sloop "Falmouth," "North Carolina," 74, Pacific Ocean, 1837–39; "Delaware," 74, Brazil, 1841–43.

Commissioned as lieutenant, 1841; steamer "Union," special service, 1843–44; steamer "Princeton," special service, 1844; sloops "Dale," "St. Mary's," and "Warren," and frigate "Congress," Pacific Ocean, 1846–48; commanded mail-steamer, 1850; commanded sloop "Warren," California, 1853–54; was executive-officer of navy-yard, Mare Island, 1855; commanded transport "Supply," Paraguay Expedition, 1858–59; commanded steamer "Wyandotte," south side of Cuba, 1859–60; commanded receiving-ship "Independence," California, 1861; light-house duty, California, 1862; commanded sloop "Narragansett" in Pacific, 1863–64; ordnance-officer, Mississippi Squadron, 1864; investigating bounty frauds, 1864; commanded "State of Georgia," South Carolina, 1864–65; commanded sloop "Tuscarora,"

Pacific Ocean, 1865–67; rendezvous in Baltimore, 1869.

During the Mexican war was in the Pacific; took part in the capture of California and defense of San Francisco; had a part in the capture of Guaymas; led the advance in storming Fort Cachori; commanded the expedition against Fort Bacoch Vampa,—took it by storm, leading the charge; was in command of the night expedition to spike a battery of guns on its way to Guaymas; passed through the enemy's lines of 1500 men with 30 men, spiked the guns, and fought his way back to the boats (12 miles), bringing off the wounded and prisoners; was commended in the public dispatches from each of his commanding officers (Capts. Craven, Yard, and Commodore Rudd) for his conduct in each of these actions. There were several other less important affairs not mentioned by name, for which he was also commended in the public dispatches from Guaymas by the above-named officers. Was at the capture of Mazatlan,—Admiral Shubrick commanding,—and was assigned the command of the outpost nearest the enemy, who held the approaches to the city, their nightly attacks being so troublesome that two men of straw had to be placed with each sentinel. Was in the battle of Trois, commanding the centre division, which became the rear on the retreat of the rear division. In this action had 1 man killed and 23 badly wounded out of 25 men; was in the action the next day, commanding the artillery at the capture of the village of Trois; received favorable mention in official reports; had frequent skirmishes with the enemy about Mazatlan, in one of which a hand-to-hand contest ensued, in which he received a lance wound in the breast.

In 1860, when in command of the "Wyandotte" at Key West, after consulting with Gen. Meigs, U.S.A., he placed his ship so as to protect Fort Taylor from the threatened attack of the rebels then mustering in force there; was deprived of his command on reporting his course to the Department. Gen. Meigs was also censured, being ordered from Key West.

Was on the coast of Mexico (Pacific Ocean) during the early years of the Rebellion; received the thanks of the State Department for his diplomatic services there; had received the thanks of the Navy Department twice during the Mexican war from two different Secretaries of the Navy.

In 1865, was ordered to report to Admiral Dahlgren, off Charleston, by whom he was ordered to command Fort Johnson; then to arrange and command an expedition up the Santee with Gen. Schemmelfinnig; then to command the expedition of Bull's Bay with Gen. Porter against Charleston, the success of which caused the fall of Charleston. In this expedition commanded 68 guns and 13 field-pieces.

Commissioned as commodore, June, 1870; light-house inspector, 1871–73.

Commissioned as rear-admiral, February 12, 1874. Retired June 4, 1874.

Staple-knee. An iron knee made in the form of a staple, having one arm secured to the deck-beam above and the other bolted to the deck-beam below, with the body secured to the ship's side.

Starboard. The right-hand side; the right side of the ship when looking forward. From the Saxon, *steoran*, to steer, and *bord*, a plank or border. *Starboard the helm*, see HELM.

STAR-BOWLINES, or STAR-BOLINS. Men of the starboard watch were formerly so called.

Star-fish. Sea-animals of the sub-kingdom of *Radiates*, class of *Echinoderms*, and of the order *Asterias*. Star-shaped, spiny-skinned animals, numerous in all seas.

Star-gazer. A spiny-rayed fish, of the family *Trachinidæ*, genus *Uranoscopus*, having its eyes directed upward. A light sail, formerly used above the sky-sails.

Stars, Fixed. Stars which to an observer on the earth maintain their places with reference to each other. Careful observations compared after a lapse of years show that some of them do move; probably none of them are absolutely fixed in space. Stars are classed by their brilliancy. (See MAGNITUDE.) In the whole heavens about 6000 stars may be seen with the naked eye; the number above the 10th magnitude is placed at 200,000; Herschel's 18-inch reflector reveals 20 millions; instruments of greater power reveal yet greater multitudes.

In olden times it was usual to indicate a star by the position it occupied in the constellation; as, the Bull's-Eye, the Lion's Heart, the Belt of Orion, etc. Many of the brighter stars have names of Latin, Greek, or Arabic derivation; as, Regulus, Sirius, Benetnash, etc. In 1604, Bayer published star-maps in which the stars were indicated by the letters of the Greek alphabet, the brightest in each constellation being α, the next β, the third γ, and so on. When the 24 letters were exhausted in designating the stars he used the Roman letters, and then numbers. The letters do not now always give the exact order of brightness.

Several catalogues of stars have been made,—the first by Hipparchus, B.C. 128, contains 7026 stars.

The polariscope shows that the stars are luminous bodies. The stellar light, analyzed by the spectroscope, indicates elements in the stars identical with those in the sun and on the earth, together with others utterly unknown.

Sirius is computed to be, as a centre of light and heat, 394 times larger than the sun. *α Centauri*, the nearest of the fixed stars, is 21 millions of millions of miles distant; Polaris is 292 millions of millions of miles distant, and the time required for the passage of light from this star to earth is about 48 years. *Periodic stars* increase and diminish in brightness at regular intervals; about 100 are known, having periods varying from a few days to many years. The most remarkable periodic star is *β Persei*, in the head of Medusa; it is of the 2d magnitude for $2^{d}\ 13^{h}$; it then changes, in 3½ hours, to the 4th magnitude; in 3½ hours more it regains its former brightness. Stars which appear single to the naked eye are sometimes resolved into two or more by the telescope. The components of a *double star* may be only apparently near; in certain cases one of the components describes an orbit about the other. In the latter case the star is known as a *physically double* or *binary* star. Single stars show great variety of color, running through shades of red, yellow, blue, and green; some stars have changed color. Sirius was formerly red; afterward it shone with purest white, and of late has a greenish tinge. Aldebaran, Antares,

and Betelgeuse are red; Arcturus is orange; Capella, bluish. Many fixed stars have a small proper motion; hence it appear that the solar system is moving through space. The motion is toward a point in the group Hercules, and is probably about a very remote centre not yet known.

STAR-NAMES.

α Andromedæ, *Alpheratz.*
β ——, *Mirach, Mizar.*
γ ——, *Almach.*
β Aquarii, *Sadalsund.*
α ——, *Sadalmelik.*
δ ——, *Skat.*
γ Aquilæ, *Tarazed.*
α ——, *Altair.*
β ——, *Alshain.*
α Argûs, *Canopus.*
γ Arietis, *Mesartim.*
β ——, *Sheratan.*
α ——, *Hamal.*
α Aurigæ, *Capella.*
β ——, *Menkalinan.*
η Boötes, *Muphrid.*
α ——, *Arcturus.*
ε ——, *Izar, Mizar, Mirach, Pulcherissima.**
β ——, *Nekkar.*
α Canum, Ven., *Cor Caroli.*
β Canis Majoris, *Mirzam.*
α ——, *Sirius.*
ε ——, *Adara.*
β Canis Minoris, *Gomeisa.*
α ——, *Procyon.*
α^2 Capricorni, *Secunda Giedi.*
δ ——, *Deneb Algiedi.*
β Cassiopeiæ, *Chaph.*
α ——, *Schedar.*
α Cephei, *Alderamin.*
β ——, *Alphirk.*
γ ——, *Errai.*
β Ceti, *Diphda.*
ζ ——, *Baten Kaitos.*
ο ——, *Mira.*
α ——, *Menkar.*
α Columbæ, *Phact.*
α Coronæ Bor., *Alphecca.*
α Corvi, *Alchiba.*
δ ——, *Algores.*
α Crateris, *Alkes.*
β Cygni, *Albireo.*
α ——, *Arided, Deneb Adige.*
π^1 ——, *Azelfafage.*
α Delphini, *Svalocin.*
α Draconis, *Thuban.*
β ——, *Alwaid.*
γ ——, *Etanin.*
α Eridani, *Achernar.*
γ^1 ——, *Zaurac.*
β ——, *Cursa.*
γ Geminorum, *Alhena.*
ε ——, *Mebsuta.*
δ ——, *Wasat.*
α^2 Geminorum, *Castor.*
β ——, *Pollux.*
κ Herculis, *Marsic.*
β ——, *Korneforos.*
α ——, *Ras Algethi.*
α Hydræ, *Alphard, Cor Hydræ.*
α Leonis, *Regulus, Cor Leonis.*
γ^1 ——, *Algeiba.*
δ ——, *Zosma.*
β ——, *Deneb Aleet, Denebola, Deneb.*
α Leporis, *Arneb.*
α Libræ, *Zuben el Genubi.*
β ——, *Zuben el Chamali.*
γ ——, *Zuben Hakrabi.*
α Lyræ, *Vega.*
β ——, *Sheliak.*
γ ——, *Sulaphat.*
α Ophiuchi, *Ras Alhague.*
β ——, *Cebalrai.*
β Orionis, *Rigel.*
γ ——, *Bellatrix.*
δ ——, *Mintaka.*
ε ——, *Alnilam.*
α ——, *Betelgeux*, or *Betelgeuse.*
ε Pegasi, *Enif.*
ζ ——, *Homan.*
β ——, *Scheat.*
α ——, *Markab.*
γ ——, *Algenib.*
β Persei, *Algol.*
α ——, *Mirfak.*
α Piscis Aust., *Fomalhaut.*
ε Sagittarii, *Kaus Australis.*
α Scorpionis, *Antares, Cor Scorpionis.*
α Serpentis, *Unukalhai.*
η Tauri, *Alcyone* (Pleiad).
α ——, *Aldeboran.*
β ——, *Nath.*
ι Ursæ Majoris, *Talitha.*
α ——, *Dubhe.*
β ——, *Merak.*
γ ——, *Phecda.*
ε ——, *Alioth.*
ζ ——, *Mizar.*
80——, *Alcor.*
η ——, *Alkaid, Benetnasch.*
α Ursæ Minoris, *Polaris.*
β ——, *Kochab.*
β Virginis, *Zavijava.*
ε ——, *Vindemiatrix.*
α ——, *Spica Azimech, Spica.*

Start. A point of land. A point of departure. The place a whale is expected to rise, after being struck. To move weights. To empty out liquids. *To start bread*, to pour it out from bags or barrels, and stow it in bulk. *To start a butt*, to loosen a plank at the butt, by the working of the ship. *To start a rope*, to ease it off a little. *To start the men*, to hurry them on deck,—formerly, by a vigorous use of a rattan or rope's-end.

START-HAMMER. A hammer with a small head, used to drive a bolt into the wood.

START-BOLT, or STARTING-BOLT. A bolt used to drive out another bolt. A drift-bolt.

STARTING-BAR. A bar by which the valve-gear of a steam-engine is manipulated by hand when starting the machine in motion, either for going ahead or backing.

STARTING-VALVE. A small auxiliary valve for admitting steam to a cylinder of an engine when starting, used to avoid manipulating the main valves by hand. Sometimes called a *tail-valve.*

STARTING-WHEEL. A wheel, worked by hand, by which the go-ahead or backing motion of the valve-gear of a steam-engine is thrown into action at will, thereby starting, stopping, or reversing the motion of the engine.

Stash it there! An old cry to enforce silence.

State-room. A small room in the cabin or wardroom of a man-of-war, or in the saloon of a merchantman, for the private use of an individual. In the wardroom the state-rooms are occupied, on the starboard side by line-officers, and on the port, by staff-officers. They are allotted according to rank, the senior officer occupying the forward room. In vessels having the wardroom forward, the senior officers are entitled to the after rooms.

Station. The allotted place of each person on board. These are designated on the station- and quarter-bill. *Cruising station*, the locality in which a ship habitually cruises. The ships of the U. S. navy are distributed among 5 stations, viz.: A. The *North Atlantic*, or *Home Station*, comprising those ships on the east coast of North America, extending east to Bermuda and south to the equator. B. The *South Atlantic Station*, comprising the shores of South America and Africa bordering on the Atlantic, south of the equator, and the waters between. C. The *European Station*, comprising the European, Mediterranean, and African coasts, as far south as the equator. D. The *Pacific Station*, comprising the west coasts of North and South America and the islands as far as Australia and the Sandwich Islands. E. The *Asiatic Station*, comprising the coasts of Asia and Africa, from Behring's Strait to the Cape of Good Hope, with all the islands contiguous. *Shore-station*, see SHORE. *Every man to his station and the cook to the fore-sheet!* calls all idlers in merchantmen. *To station*, to post or place a man in a particular place, as a sentry on his post, a hand by the fore-sheet, etc. *To station look-outs*, is to send them to their allotted places

STATION-BILL. A bill containing a list of the crew, with their stations and duties for all evolutions. See WATCH-, QUARTER-, AND STATION-BILL.

STATIONER (*Eng.*). One who has served long in any particular station.

STATION-POINTER. An instrument used in maritime surveying, to lay down points on a chart from angles previously measured. Three arms move about a central pivot, and arcs are attached graduated so as to set these arms to any angles, and by this means find the point desired, and lay it down on the chart.

STATIONS FOR STAYS! A preliminary order in tacking, or box-hauling ship, to direct the men to their stations.

Staunch. A flood-gate in a river, so contrived as to form a head of water, and float lighters over shallows.

Stave. To break a hole in a boat. To drive in the head of a cask. *Stave off*, to boom off, or to push off with a small spar. Figuratively, to cause to be deferred.

Stay. A strong rope, leading from the head of any mast, forward. A support to a davit,

* A name given by modern astronomers to express the extreme beauty of this double star (orange and green), viewed with a good telescope.

bumpkin, etc. A stay-tackle. A bar or rod confining two or more parts of a structure or machine to an invariable relative position. Tie-bars or rods are sometimes called *stays.* The stays of a ship that lead forward to the centre line of the ship are *fore-and-aft stays.* Those leading aft to the ship's side are *backstays.* The various stays will be found described under their headings. A *steamer's stay* is an iron rod uniting the paddle-boxes. A *jumper-stay* is a main-stay which comes to the side of the ship. These are necessarily used in steamers, where the funnel interferes with their leading straight. *To stay,* to support a mast by setting up the rigging. To tack, to bring the ship's head to the wind in going about. *In stays,* or *hove in stays,* in the act of going about. *To refuse stays,* to fail to tack. *To miss stays,* to fail in an attempt to put the ship about.

STAY-APEEK. See APEEK.

STAY-BAR, or STAY-ROD. Strong bars or rods supporting the top of a furnace.

STAY-BOLT. A short *stay* or *bolt* for supporting the flat surfaces of the shells, fire-boxes, etc., of a steam-boiler.

STAY-HOLES. Holes in the luff of a stay-sail, for the lacing, rings, or hanks that fasten it to the stay.

STAY-ROD. See STAY.

STAY-SAIL. A triangular or trapezoidal sail hoisted on a stay.

STAY-SAIL-NETTING. A rope or canvas receptacle on the bowsprit for the fore-topmast stay-sail.

STAY-SAIL-STAY. The stay on which a stay-sail is set. Sometimes, as in the case of the *fore-storm stay-sail,* this is a separate stay, only gotten up in time of need. When on the *standing-stays,* the *port-* or *spring-stay* is preferably used for a stay-sail. A stay-sail is fastened by its tack, and hoists along the stay, being confined to it by wooden or iron thimbles, or rings, by rope or hide hanks, or by bridles or lacings toggled into the stay-holes, or into eyes.

STAY-TACKLE. Any tackle put on a stay for hoisting out or moving weights. A stay-purchase, a tackle used in setting up a stay. Tackles hooked to the ends of the triatic-stay, used in hoisting boats' anchors, etc., in conjunction with the yard-tackles.

Steady! An order to the helmsman to steer as the ship heads.

Steady-fast (*Eng.*). A hawser carried out to some fixed object, to keep a ship steady in a tide-way, or to make sail from.

Steal. To gain a ratline or two in going aloft, while waiting for the order. To pick up the sail before the order to furl is given. To gain distance ahead in light airs.

Stealer. A plank introduced at the stem or stern between curved edges and straight-edged planks.

Steam. An elastic vapor into which water is converted when heated to the boiling-point. This point depends on the amount of salt in the boilers, and for fresh water is 212° F. Advantage is taken of the elasticity of steam in the steam-engine, where its expansive force is transferred to other mechanical powers through the piston. *High-pressure steam* is that whose temperature is far above the boiling-point. *Low-pressure steam* is that at the boiling temperature. *Saturated steam,* or *wet* steam, is that which holds water in mechanical suspension. *Superheated, surcharged,* or *anhydrous* steam is that which is heated after separation from the water, until all the water held in suspension is vaporized. *Dry steam* holds but little water in suspension. *The mechanical equivalent of steam* is the amount of force it exerts to raise 1 pound of water, 1° F. in temperature, and this is 772 foot-pounds. The conditions affecting steam vary with its temperature, but at 212°, saturated steam exerts a pressure of 14.7 pounds per inch. Its total heat is 1.146°, its latent heat being 965.2°; its weight per cubic foot is .038 pound, and the volume of 1 pound is 26.36 cubic feet. The volume of 1 cubic foot of water after evaporation is 1642 cubic feet, at a temperature of 212°.

STEAMBOAT. A boat propelled by steam. The term is generally applied to river and coasting steamers.

STEAM-BOILER. See MARINE STEAM-BOILER.

STEAM-BOILER ALARM. An alarm, to tell when the water is low in the boiler.

STEAM-BOX, STEAM-CHAMBER, STEAM-CHEST, STEAM-DOME, STEAM-CHIMNEY. Synonymous terms for a receptacle of steam from a boiler; the object of the device is to temporarily check the velocity of the steam so that water held in suspension, either by condensation or being drawn from the boiler by induction, may have time to precipitate before passing to the engine. A *steam-chimney* is usually an annular steam-space surrounding the lower part of the smoke-pipe, by which arrangement the steam is dried and somewhat superheated. The term *steam-chest* is frequently applied to the valve-chest of an engine.

STEAM-CASING. See STEAM-JACKET.

STEAM-CUTTER. A steamboat, smaller than a launch.

STEAM-GAUGE. An instrument for indicating steam-pressure by means of a dial and index, or a plain graduated scale. There are numerous devices, nearly all depending for their action upon the resilience of metal or the weight of a column of mercury. The latter, only, can be considered reliable.

STEAM-GUN. A gun in which balls are propelled by the force of steam. Leonardo da Vinci describes one in a manuscript of 1500. Van Etten, in 1629, also described one. One was made and shown in England in 1824. Bessemer proposed to throw balls from the nozzle of a steam-pump, or fire-engine. Wood and Lay devised a steam-gun to be used under water, but it was not successful. The elastic force of steam is not a constantly increasing succession of shocks, such as is necessary in a gun, and will probably never be successfully used in this connection.

STEAM-HOIST. A steam hoisting-machine used in navy-yards for various purposes.

STEAM-JACKET. A device by which a steam-cylinder is surrounded by a thin film of live steam; the object being to prevent the condensation, due to various losses of heat, of a large quantity of *working* steam within the cylinder, and the consequent loss of latent heat, by the expenditure of a smaller quantity of heat from steam of higher temperature.

STEAM-LAUNCH. A launch fitted with steam-power, furnished to most modern men-of-war. *Steam torpedo-launches* are for the purpose of

exploding torpedoes under the enemy's bottom, and are long, narrow, and flat. See TORPEDO-LAUNCH.

STEAM-PIPE. A pipe for conducting steam from a boiler to an engine, heater, evaporator, or other apparatus where it performs work.

STEAM-PORT. An opening for the admission of steam to a cylinder, and, except in a few special devices, for its expulsion therefrom after having performed its work.

STEAM-ROOM. The space contained within a steam-boiler for the accumulation of steam above the water-level.

STEAMSHIP. Any large vessel driven by steam. See STEAM-VESSEL.

STEAM-TOE. A cam-shaped, oscillating arm or lever, forming part of some kinds of valve-gear, for opening and closing the steam-valve of an engine, as in the Stevens cut-off.

STEAM-TUG. A small steam tow-boat.

STEAM-VESSEL. A vessel propelled by steam-power. The first attempt to propel vessels by steam-power was made at Barcelona, by Blasco de Garay, in 1542, and various attempts were made during the 16th, 17th, and 18th centuries, but it was not until the beginning of the present century that successful *steamboats* were built, Fitch running a boat on the Potomac in 1787, Symington, the "first practical steamboat," the "Charlotte Dundas," in 1801, and Fulton, the "Clermont," first to regularly engage in traffic, in 1802.

STEAM-WHISTLE. An apparatus attached to an engine, through which steam is discharged, making a shrill sound by striking the edges of a metal cup, causing it to vibrate.

STEAM-WINCH. A hoisting-machine, or windlass, which is made to revolve by a crank connected with the piston of a small cylinder. They are extensively used on modern men-of-war, for various purposes.

Steedman, Charles, Rear-Admiral U.S.N. Native of Charleston, S. C. Appointed midshipman in the navy, April 1, 1828; first duty at the New York Navy-Yard; served in the West Indies as midshipman in the sloops-of-war "Natchez" and "Fairfield," and schooner "Grampus."

Promoted to passed midshipman, January 14, 1834. In the Mediterranean on board of the frigates "Constitution" and "United States" and schooner "Shark" in the years 1836–38; and in the West Indies on board the "Macedonian" up to 1840,—the last six months as acting lieutenant.

Promoted to lieutenant, February 25, 1841; served in the brig "Dolphin" on the Home Station and West Indies; invalided and sent home 1842; coast survey, 1843–44; served in the West Indies and Gulf of Mexico on board of the "St. Mary's," 1845–47; commanded the 8-inch gun in the naval battery at the bombardment of Vera Cruz, and commanded the "St. Mary's" launch in an attempt to surprise and capture Mexican gunboats inside of Tampico bar; attached to Naval Observatory from latter part of 1847 to first of 1849; served on board frigate "Cumberland" in the Mediterranean, 1850–51; attached to Naval Observatory, 1853–55.

Commissioned as commander, September 14, 1855; special duty in Washington, 1857–58; revising signal code and framing station-bills for ships of the navy; commanded brig "Dolphin," Paraguay Expedition, 1859–60, and was left in command of Brazil Squadron when Flag-Officers Shubrick and Forrest returned home, remaining in command for nine months until the arrival of Flag-Officer Sands; returned home in December, 1860. At breaking out of the Rebellion was on leave; volunteered to Admiral Dupont for any service, and was by him sent to take command of the Baltimore Railroad Company's steamboat "Maryland"; kept communication open between Havre-de-Grace and Annapolis until the railroad bridges were repaired and communication opened between Baltimore and Philadelphia; was first to telegraph from Havre-de-Grace to Gen. Patterson that Gen. Butler had landed at Annapolis with Massachusetts regiment and Seventh New York Regiment, and had opened communication with Washington; in 1861, ordered to join Commodore Foote on the Mississippi; soon detached and ordered to take command of the "Bienville"; attached to Port Royal Expedition under Flag-Officer Dupont; led the second column in the attack and capture of Port Royal; brought North, in the "Bienville," Flag-Officer Dupont's dispatches reporting the capture; after this assisted in blockading the coast of Georgia in the "Bienville," and participated in the capture of all the ports on that coast south of Savannah; returning North, was detached from the "Bienville" and ordered to the "Paul Jones"; joined Admiral Dupont's squadron with the "Paul Jones" and other gunboats; engaged Fort McAllister, on the Ogeechee River, in August, 1862; on the 17th September following engaged and silenced the batteries at St. John's Bluff, on the St. John's River, Fla.; considering it necessary to have troops to co-operate in capturing the forts and getting possession of the river, applied to Admiral Dupont for the same on the 30th of same month; with the co-operation of Gen. Brannon captured the forts on St. John's Bluff, and with the gunboats opened and held the St. John's River to Lake Beaufort.

Commissioned as captain, September 13, 1862. Transferred to the steam-frigate "Powhatan," and employed in her blockading off Charleston for several months; with the "Powhatan" towed the captured ram "Atlanta" to Philadelphia; soon after was detached and took command of the "Ticonderoga"; in her was employed on various detached service; returned in her in November, 1864, with engines disabled from an unsuccessful search of the rebel vessel "Florida," on the coast of Brazil; volunteered to join Admiral Porter's command; vessel temporarily repaired; joined the admiral and participated in the two attacks and capture of the forts at the mouth of the Wilmington River, December, 1864, and January, 1865; after the fall of those forts joined Admiral Dahlgren's squadron off Charleston; the "Ticonderoga" being unfit for service, was ordered to Philadelphia for repairs; so soon as she was repaired, proceeded, November, 1865, to the Mediterranean and joined Admiral Goldsborough's European Squadron.

Promoted to commodore, July 25, 1866; soon after exchanged commands with Capt. Wyman, of the "Colorado"; returned home in the "Colorado," September, 1867; on special duty, 1868–69, and commanding Boston Navy-Yard, 1869–72.

Commissioned as rear-admiral, May 25, 1871. Retired September 24, 1873.

Steel. See Iron and Steel.

Steel-bronze. A mixture of steel, tin, and copper, used in making guns. It was patented in 1870 in Boston, and is extensively used in Austria for the manufacture of light guns.

Stembel, Roger N., Rear-Admiral U.S.N. Born in Middletown, Md. Appointed from Ohio, March 27, 1832; attached to schooner "Porpoise," West India Squadron, 1832–33; Naval School, New York, 1834–38.

Promoted to passed midshipman, June 23, 1838; attached to frigate "Brandywine," Mediterranean Squadron, 1840–42.

Commissioned as lieutenant, October 26, 1843; coast survey, 1844–47; sloop "Levant," Home Squadron, 1849–50; sloop "Jamestown," Brazil Squadron, 1851–53; special duty, Washington, 1855–57; steam-frigate "Mississippi," East India Squadron, 1857–59; special duty, Cincinnati, 1861.

Commissioned as commander, July 1, 1861; Mississippi Flotilla, 1862; engagement at Lucas Bend, September 9, 1861; Belmont, November 7, 1861; Fort Henry, February 6, 1862; bombardment and capture of Island No. 10, Mississippi River, from March 16 to April 7, 1862; engaged near Fort Pillow with rebel rams, May 10, 1862, besides several minor affairs, while attached to Mississippi Flotilla, from August, 1861, to May, 1862; wounded near Fort Pillow, May 10, 1862, in engagement with rebel rams; waiting orders, 1863; rendezvous, Philadelphia, 1864; special duty, Pittsburgh, 1865.

Commissioned as captain, July 25, 1866; commanding steam-sloop "Canandaigua," European Squadron, 1866–67; commanding naval rendezvous, Boston, 1869–70.

Commissioned as commodore, July 13, 1871; commanding North Pacific Fleet, 1872. Retired December 27, 1872.

Commissioned as rear-admiral, February 2, 1875.

Steep-to. Said of a bold shore, near to which vessels may approach.

Steep-tub. A large tub for soaking salt-provisions.

Steer. To direct or govern a ship by the motions of the rudder. It requires considerable skill to steer well, the helmsman being compelled not only to watch the compass and the ship's head, but also to feel and anticipate the motions of the ship in a sea-way. To *steer large* is to use much helm, or to steer loosely, and also to go free. To *steer small* is to steer with little helm, or small movements of the wheel. To *steer the course* is to lay the course with a free or fair wind.

Steerage. The act of steering. The effect of the helm on a ship. (*Eng.*) That part of the ship below the quarter-deck and before the cabin bulk-head of a man-of-war. (*Eng.*) The cabin of the middle-deck of a three-decker. The forward part of the lower-deck of a passenger-steamer or ship. That portion of the berth-deck of a man-of-war just forward of the ward-room, and furnished with lockers, mess-tables, and sometimes with berths.

Steerage-officer. An officer living or messing in the steerage. Steerage-officers in the U.S. navy are clerks, midshipmen, cadet-midshipmen, mates, cadet-engineers, ensigns when not in charge of a watch and division, and all officers ranking with ensign.

Steerage-passenger. A second- or third-class passenger in a merchant vessel.

Steerage-way. The motion of the vessel through the water, sufficient to cause her to obey the helm.

Steering Apparatus. Machinery giving increased power for the management of the rudder. Many forms have been invented, and some are successfully used. *North's steering apparatus* consists of a wheel turning a horizontal shaft on a table, geared to a vertical shaft on which is a drum with a chain fastened to it. The ends of this chain connect to a quadrant on the rudder-head, and motion is thus given to the rudder. *Jackson's* is a right- and left-handed screw on the shaft of the wheel, on which sleeves move, attached to levers. These levers move the tiller, as the wheel works the screws. These forms of steering gear are generally used as preventer-gear, situated aft, while a wheel situated forward steers the ship ordinarily, by means of rods or chains running aft to the tiller. These are now superseded in large ships by steam- or hydraulic gear. The steam-gear is of various patterns. That used in the English navy has two small engines connected with the tiller, whose valves are controlled by a light steering-wheel. Another English apparatus consists of a pair of cylinders acting by gearing on a worm-wheel, to the shaft of which the steering-barrel is keyed, and a chain on this barrel moves the tiller. Automatic gear stops the engine when the rudder is hard over. *Sickles's gear*, on the "Miantonomoh," consists of two cylinders moving a crank attached to the shaft of the steering-barrel. Wire-rope is wound on this barrel, which is so made that double the leverage is effected when the helm is hard over. A hand-wheel on the same shaft moves the engine-valves by a cam and yoke, and the engine stops when the shaft reaches the same point to which the hand-wheel has been turned. The *Brotherhood apparatus* uses three cylinders, and lays the tiller at any angle.

Hydraulic steering-gear has been used in some large modern ships, and is very successful. In it a small tiller opens the valves of the hydraulic pump. Other steering-gear connects with the propeller.

Steering-propeller. A propeller so contrived that the ship is steered by it without a rudder. The first attempt to so control a ship was made by Stevens, who thought that he could control a vessel by right- and left-handed screws, but these do not act sufficiently well. Other devices are in use, the Fowler and Mallory wheels being the most successful. *Hunt's steering-propeller* changed the angle of the shaft of the screw by a small hand-wheel, connected to it by gearing from above.

Steering-sail. A studding-sail.

Steering-signals. Signals made by an electric apparatus connected with the helm, so as to indicate the position of the rudder and its movements. Several such apparatus have been devised, but none are in general use. Signals from the commander-in-chief prescribing the courses to be steered.

Steering-wheel. The wheel by which the

tiller is moved. The ordinary steering-wheel is a common wheel whose spokes project beyond the rim, and whose hub is prolonged to form the barrel. On this barrel is wound the wheel-rope. By moving the wheel to the right or left, the opposite rope is wound on the barrel, thereby moving the tiller to that side. In men-of-war the wheel is ordinarily aft, just forward of the mizzen-mast, but in some modern ships it is placed in a shot-proof house on the forward part, or near the middle of the deck, or even on the bridge or hurricane-deck. Duplicate wheels are often used in different positions. In merchant steamers wheels are generally placed in pilot-houses forward, and connect by chains or rods with the tiller. Wheels are also used with screw- and steam-steering-gear, as described in STEERING APPARATUS, which see.

STEERSMAN. A helmsman.

Steeve. To elevate at an angle any spar, as a bowsprit. To stow cargo in the hold by a *steeve*, or by a jack-screw. The angle which a spar, as the bowsprit, makes with the horizon. A long derrick or spar, with a block at one end, used in stowing cargo.

Stellwagen-cup. A sounding-cup devised by Lieut. Stellwagen, U. S. navy, for bringing up portions of the bottom.

Stem. The main timber at the forward end of the ship, formed by a combination of several pieces into a curvilinear figure. Its lower end scarfs into the keel, and it receives the ends of the planking around the bow. *To stem*, to make headway against a tide or current.

STEMSON, or STEM-KNEE. A piece or pieces of curved timber wrought on the after part of the apron, on the inside of the ship. Its lower end scarfs into the keelson, its upper end being continued as high as the middle or upper deck.

Step. A step, generally, is a framing in wood or iron, which is intended to receive an upright shaft. *To step*, to fix a boat's mast or a lower mast in position. At the present time, the fore- and mainmasts are stepped in cast-iron mast-steps, made to fit down over the main keelson, with a broad flange on the sister keelsons, to which they are secured. The mizzen-mast steps in a piece of live-oak timber, scored down over the berth- or orlop-deck beams, to which it is secured. *Steps of the side*, pieces of oak, worked with moldings, and fastened on the ship's side at the gangway, for the convenience of ascending and descending when the accommodation-ladder is unshipped.

STEPPING-LINE. The bearding-line, or the line of the top of the rabbet on the dead-wood on which the frame-timbers step.

Stephenson-link. A part of the valve-gear of a steam-engine by which the motion from either the go-ahead or backing eccentric, or a combined motion of the two, is transmitted to the valves, without "unhooking" or disconnecting. The engine can be stopped by bringing both eccentrics into nearly equal action upon the valves, which is accomplished by placing the link in mid-position by means of the reversing-gear; and a *variable cut-off* within narrow limits may be effected by setting the link in various positions by the same means.

Sterlet. A species of sturgeon (*Acipenser ruthenus*), found in the Caspian Sea, and its rivers, from whose roe is made the finest caviare.

Stern. The whole after part of the ship, as the forward part is called the bows, but more especially that part of the ship which is bounded by the main-transoms and the counter-timbers.

STERN-BOARD. The backward motion of a ship, resulting from negligence at the helm, or bad seamanship; or the effect of an intentional manœuvre, as that of throwing sails aback suddenly to avoid a danger. *To make a stern-board*, to fall astern in tacking.

STERN-BOAT. A boat carried astern.

STERN-CHASE. A chase where one vessel follows the other in her wake, both steering the same course. A proverb makes it "long but sure."

STERN-CHASERS. Guns firing directly aft.

STERN-DAVITS. Davits to which a stern-boat is hoisted.

STERN-FAST. A rope confining the stern to a wharf, or buoy.

STERN-FRAME. The stern-post, transoms, and fashion-pieces, bolted together, constitute the stern-frame.

STERN-GALLERY. A gallery or walk formerly built across the square sterns of large ships. On three-deckers there were two.

STERN-KNEE. A large knee which forms the lower piece of the dead-wood aft and connects the stern-post to the keel, the arm being securely bolted to the stern-post and the body to the keel.

STERN-LADDERS. Rope ladders hung on either quarter, for convenience in ascending. At sea they have long laniards trailing astern.

STERNMOST. Farthest in the rear.

STERN-PORTS. Ports made in the stern of the ship, so that guns may be used as stern-chasers.

STERN-POST. A long, straight piece of timber whose lower extremity is securely fastened and tenoned into the keel, and whose top is secured to the main-transom. It receives the ends of the planking at the after end of the ship. In iron ships it is simply a bar of iron bolted to the keel, to which the plates at the after end are riveted.

STERN-SHEETS. The after part of a boat, between the after thwart and the coxswain's box.

STERNSON. The upper piece of curved timber uniting the dead-wood to the stern-post at the upper end in wooden ships.

STERN-WALK. A stern-gallery.

STERN-WAY. The opposite of headway. Motion backward, or astern.

Stevedore. A stower. One employed to stow the hold of vessels, or to unload from the hold.

STEVEDORE'S-HOOK. An iron hook with a handle, to hook in bales, etc.

Stevens, Thomas Holdup, Commodore U.S.N. The subject of this sketch was born in Charleston, S. C., February 22, 1795. Losing his parents early in life, Gen. Daniel Stevens, an eminent citizen of that State, and the first mayor of that city, became specially interested in him, and eventually adopted him. Entering the navy as a midshipman, January 16, 1809, he was ordered to the Charleston Station, upon which duty he remained until ordered to the sloop-of-war "John Adams," on board of which vessel he remained until the fall of 1812, when, as an acting lieutenant, he accompanied Commodore Chauncey to Sackett's Harbor, where a naval force was being organized for co-operation with the army on the frontier, and to operate against the floating force of the enemy upon the Northern lakes. Shortly after reaching Sackett's Har-

bor he was assigned to duty on the Niagara frontier with Capt. Angus, and was with that officer in the desperate night attack upon the enemy's works opposite Black Rock. Of his conduct upon that occasion Capt. Angus reports: "I was, immediately after landing, joined by the truly brave Holdup Stevens, who behaved himself like a gallant and valuable officer." And again: "As for the gallant Wragg, Dudley, and Holdup Stevens, their conduct speaks for itself." In recognition of this splendid service he was commissioned a lieutenant in the early part of January, 1813. (For further notice of his war-service see Cooper's "Naval History.") Congress voted him a silver medal for Lake Erie, and the citizens of Charleston, S. C., presented him a sword. Remaining upon the lakes as executive-officer of the "Niagara" until November 19, 1814, he was then ordered to the frigate "Java," fitting out under Commodore O. H. Perry for a cruise in the Mediterranean. In 1819–20 he was attached to the frigate "Constellation," and for two years subsequently was attached to the navy-yard, New York, under command of Commodore Chauncey. When the Mosquito Fleet under Commodore Porter was being fitted out for the suppression of piracy in the West Indies, he was ordered to report for duty to that officer, and was first assigned to the command of the "Asp," subsequently to the command of the schooner "Jackal," and later to command the schooner "Shark," in which vessels he rendered efficient and valuable service, and added largely to his brilliant reputation. In March, 1825, he was promoted to a master commandant, and in 1827-29 was the executive-officer of the Washington Navy-Yard, remaining, upon the death of Commodore Tingley, temporarily in command. Upon the expiration of this term of service he was ordered to the command of the sloop-of-war "Ontario," one of the vessels comprising the Mediterranean Squadron, under the command of Commodore James Biddle, and upon various occasions was intrusted by that distinguished officer, whose confidence he possessed to an eminent degree, with duties of a highly responsible, grave, and delicate character. Returning to the United States with the respect, esteem, and affection of all with whom he had been associated, he was ordered to the command of the naval rendezvous at Boston, where he remained, popularizing the navy and himself through his rare social gifts and high qualities, until promoted to a captain, in 1836. In 1840–41 he commanded the navy-yard and station at Washington, D. C., with signal success and ability. While upon this duty a very serious difficulty occurred between the late Commodore M. C. Perry and Admiral F. H. Gregory, which was only prevented from a mortal issue through the earnest and untiring efforts and friendly interference of that gifted and incomparable officer, Commodore Charles Morris, and the chivalric officer of whom we write.

Cut off in the vigor and bloom of manhood, with the past an earnest of his future, we have just reason to believe that in the stormy times in which we have recently lived, had his life been spared, he would have been, through the force of his character and his high professional qualities, a prominent actor and a conspicuous leader.

The *National Intelligencer*, of Washington, at that time edited by Mr. Seaton, published the following beautiful tribute to Commodore Stevens at the time of the publication of the General Order announcing his death:

"The Naval Order which appears to-day will announce to our readers the decease—sudden and unanticipated as it is afflicting—of Commodore Thomas Holdup Stevens, of the navy. In the meridian of life, and in the enjoyment of the highest health, he retired to bed on Wednesday night, and before morning the angel of death had stricken him from the number of the living. We know not when any instance of those solemn dispensations which Providence orders, as it were, as admonitions of the uncertain tenure of existence, has struck upon us more painfully.

"Open-hearted, frank, and generous, we know not a man who made his way so directly to the affections of all to whom he became known as this gallant and lamented officer; and proportionably keen is the sorrow for his loss and the sympathy which is universally felt for his large and estimable family.

"Commodore Stevens was a native of Charleston, S. C., and entered the navy in 1809, at the early age of fifteen. Young as he was, he had distinguished himself in the war of 1812, even before Perry's brilliant victory on Lake Erie, and he commanded one of the vessels in that ever-memorable battle. As a man, he was without reproach, and as an officer, he was regarded as one of the brightest ornaments of the navy in peace, as he had been one of its most gallant sons in war."

Stevens, Thomas H., Rear-Admiral U.S.N. Born in Connecticut. Appointed from Connecticut, December 14, 1836; attached to razee "Independence," Brazil Squadron, 1838–41.

Promoted to passed midshipman, July 1, 1842; surveying duty, Gulf of Mexico, 1842–43; steamer "Michigan," on the lakes, 1843–44; naval storekeeper, Honolulu, 1845–48; Naval Station, Sackett's Harbor, New York, 1849.

Commissioned as lieutenant, May 10, 1849; attached to steamer "Michigan," on the lakes, 1849–51; coast survey, 1852–55; steam-frigate "Colorado," Home Squadron, 1858–60; commanding steam-gunboat "Ottawa," 1861–62; participated in the engagement with the rebel fleet at Port Royal, November 4, 1861; and engagement with Forts Beauregard and Walker, November 5, 1861; battle of Port Royal and capture of Forts Beauregard and Walker, November 7, 1861; battle of Port Royal Ferry, January 1, 1862; engagement with Tattnall's rebel fleet, February, 1862; capture of Fort Clinch and the towns of Fernandina and St. Mary's, and steamer "Darlington," March 3, 1862; engagement with enemy's riflemen on the St. Mary's River, March 6, 1862; during the months of March and April, 1862, Lieutenant Stevens was in command of the first expedition up the St. John's River, which captured Forts Steele and Finnegan, with their guns, etc., and the towns of Mayport, Jacksonville, Magnolia, and Pulaski, and yacht "America."

Commissioned as commander, July 16, 1862; commanding steamer "Maratanza," North Atlantic Blockading Squadron, 1862; present at the battle of West Point, and in command of the first naval expedition to Cumberland and White

House to open the river for and support the advance of Gen. McClellan, May, 1862; present at demonstration against Petersburg and battle of Malvern Hill, June, 1862; on July 4, 1862, the "Maratanza," under the command of Commander Stevens, captured the rebel gunboat "Teazer"; commanding ironclad "Monitor," North Atlantic Blockading Squadron, 1862; while in command of the "Monitor," covered the flank of McClellan's army on the James River and the rear in his withdrawal from the Peninsula; commanding steamer "Sonoma," West India Squadron, 1862–63; capture of schooner "Clyde," steamer "Victoria," brigantine "Atlantic," bark "Springbok," steamer "Virginia," and chase of rebel privateer "Florida" for 34 hours; commanding ironclad "Patapsco," South Atlantic Squadron, 1863; while in command of "Patapsco," participated in engagement with Fort Morgan, August 22, attack on Fort Sumter, August 23, and engagement with Fort Moultrie, Battery Bee, and adjacent batteries, in command of 4 monitors, August 31; on September 1, demonstration against Fort Sumter and obstructions; September 6, engagement with Forts Wagner and Gregg and capture of the same; September 7, demonstration against Fort Sumter and obstructions, and engagement with all of Sullivan's Island batteries; September 8, engagement with Sullivan's Island batteries; in command of boat assault on Fort Sumter on the night of September 8; bombardment of Fort Sumter, from October 25 to November 4, inclusive; commanding steam-sloop "Oneida," Western Gulf Blockading Squadron, 1863–65; operations before Mobile, from July 1 to August 3, 1864; to enable Commander Mullany (now rear-admiral), who had volunteered for the occasion, to participate in the fight, Stevens consented to take the double-turreted monitor "Winnebago," and Mullany was assigned to the "Oneida" (by this arrangement both these officers commanded fighting ships); commanded monitor "Winnebago" in engagement with Fort Powell, driving off reinforcements and supplies, August 4, and in battle of Mobile Bay, and capture of rebel ram "Tennessee" and fleet, and at capture of Forts Powell and Gaines; bombardment and capture of Fort Morgan; while in command of "Oneida," May 13, 1865, off Boca Chico, Texas, covering left flank of the army from apprehended attack; present at the ratification of the agreement for the surrender of the trans-Mississippi army by Gens. Curtis, Smith, and Magruder; in command of Texas division of Gulf Squadron, July, 1865; in August, returned to New York in command of the "Oneida."

Upon the occasion of his leaving the squadron, the following letter was addressed him by the late Admiral Dupont:

"I cannot permit you to leave without expressing my regret at your withdrawal from my squadron, having ever found you prompt, energetic, skillful, and brave in all the duties pertaining to your command. Your operations on the St. John's River, as senior officer of the naval forces which took possession of those waters, were attended by circumstances requiring judgment and discretion, both of which you exhibited in a manner highly satisfactory to me.

"I am, sir, respectfully, your obedient servant,
"S. F. Dupont."

Upon being relieved of the command of the "Monitor," then in Hampton Roads, the present rear-admiral, John Rodgers, wrote as follows:

"In all the time of our companionship on duty you have evinced courage and coolness. In our reconnoissance of the forts at Hilton Head previous to the grand attack, in the grand attack in which they were taken, in the Cooper River, in the Appomattox, with your vessel aground under very trying circumstances, you have exhibited the characteristics of a valuable officer. I have not cited occasions of which I have only heard, but of which I have been mindful, where your conduct has received the warmest praise. Everywhere you have shown yourself a dashing, zealous officer."

Rear-Admiral Charles Wilkes, in a letter to the Secretary of the Navy, in reference to Capt. Stevens, writes,—

"I have had many and favorable opportunities, having been associated with him (Commander Stevens), and he served under my command in the James River, and in the West Indies, most of the time under my immediate observation. His patriotism is beyond doubt; his ability as an officer is second to none in the navy; he has at all times given me on duty entire satisfaction in the performance of his duties, and the zeal with which he executed them. I think him a high-toned officer and a gentleman, and know him to be an ornament to the service. His duties engrossed his whole attention; ever ready and prompt in their execution, winning my entire satisfaction and confidence in his willingness, activity, and ability in the execution of orders. His command was always held ready for duty, and through his example, energy, and good management he fulfilled many orders, overcoming great difficulties he had to encounter. He is brave and chivalric; no officer could have shown more attachment to the Union cause during the late war, and none exerted themselves more to maintain and restore the Union, and uphold the honor of our flag."

Commissioned as captain, July 25, 1866; light-house inspector, 1867–70; commanding frigate "Guerriere," European Squadron, 1870–71.

Commissioned as commodore, November 20, 1872; commanding navy-yard, Norfolk, Va., 1873–76. While on this duty, assigned by the President, at the request of the governor of Virginia, as member of the U. S. Advisory Board of Harbor Commissioners of Norfolk and Portsmouth; continued upon same duty after being relieved as commandant of the yard, upon expiration of term, and also employed at present as president of board for examination of and report on "Puritan." Special duty, Norfolk harbor, 1876–80.

Commissioned as rear-admiral, October 27, 1879; commanding Pacific Squadron, 1880.

Steward. A person employed on board ships to provide for the table, superintend its culinary affairs, etc. In merchant ships he provides for the tables of passengers, crew, and officers, has charge of the saloons, baggage, etc. In men-of-war there are several stewards. The *paymaster's steward* is now styled in the navy the *paymaster's yeoman*, and he has charge of the store-rooms, issues small stores, serves out rations, and assists in issuing clothing, etc. The *admiral's steward*,

captain's steward, wardroom steward, steerage steward, and warrant-officers' steward, are petty officers, receiving from $19.50 to $41.50 per month, and charged with providing for the various messes under their charge. *Hospital steward*, the former title of the apothecary, which see.

Stewardess. A woman employed in passenger vessels to attend to the wants of female passengers.

Stewart, Charles, Rear-Admiral U.S.N., was born in Philadelphia, July 28, 1778. He entered the merchant service at the age of 13, and rose to the command of an East Indiaman. Was commissioned lieutenant in the navy, March 9, 1798. Was fourth lieutenant of the "United States," under Barry, in the West Indies. In 1800, commanded the schooner "Experiment"; captured the schooner "Deux Amis." Chased by two French vessels, soon after, he captured one, the "Diane," by a skillful ruse, and next a privateer, the "Laura Bridger." Was in charge of the "Chesapeake," in 1801, and in 1802 sailed for the Mediterranean as first lieutenant of the "Constellation," Capt. Murray, and was in the first brush with Tripolitan boats. Returning in 1803, was given command of the brig "Siren," and arrived off Tripoli, October 1, 1803. Convoyed the party, in the ketch "Intrepid," that destroyed the "Philadelphia," and was senior officer of that expedition. Named senior master-commandant in May, 1804, and on the 2d of March captured the privateer "Transfer." Engaged with batteries and boats, in April; in the attacks of August 4, August 7, August 28, and September 3, on Tripoli. Was promoted to captain April 22, 1806. Superintended construction of gunboats in New York, 1806–7, and was in the merchant service from 1808 to 1812; fitting out the "Argus" and the "Hornet," 1812, and then commanded the "Constellation." In conveying her down Chesapeake Bay, he encountered a British fleet, and only avoided it by superior seamanship. Afterward, assisted in the defense of Norfolk. Commanded the "Constitution" next, joining her in December, 1813, and in November, 1814, captured the "Pictou" (14) and other vessels. Sailing again, December 17, crossed the Atlantic, and made two prizes. On the 20th of February, 1815, after a gallant fight, he captured the "Cyane" (20) and "Levant" (18). Was chased by a squadron, and lost the "Levant." He received a gold medal and a sword, the thanks of Congress and of the Pennsylvania Legislature, and the freedom of the city of New York. In 1816, commanded the Mediterranean Squadron in the "Franklin" (74), until January, 1820. In 1821, commanded Pacific Squadron until 1824. For alleged irregularities he was tried on his return home, in 1825, but acquitted. Waiting orders, 1826, 1827, 1828; president Examining Board, 1829; Commissioner of the Navy, 1830–32; waiting orders, 1833–37; Philadelphia Navy-Yard, 1838–41. During the latter year he was spoken of as candidate for President, but not nominated; 1842–43, in command of the Home Squadron; 1844–45, waiting orders; 1846, commanded navy-yard, Philadelphia; waiting orders, 1850–54. In 1852 he became the senior officer of the navy; 1854, navy-yard, Philadelphia, which position he held until 1861; was retired as senior commodore in 1856, when 78, and was promoted to the rank of flag-officer in 1860; was on waiting orders until his death. Promoted to rear-admiral, July 16, 1862. He died at Bordentown, N. J., November 6, 1869, aged 91, having been the senior officer in the navy for 17 years (the eighth to hold that office), and in the service 71 years.—*F. S. Bassett, Lieutenant U.S.N.*

Stick. A term applied to a mast.

Stickle-back. A small fish of the genus *Gasterosteus*, so called from the spines which arm their back, ventral fins, and other parts.

Stiff. That quality in a vessel which enables her to carry a press of sail without careening much. A stiff ship is not necessarily stable. *Stiff bottom*, a hard, tenacious, muddy bottom. *Stiff breeze*, a strong breeze, in which a press of sail may be carried.

STIFFENING-ORDER (*Eng.*). A custom-house warrant, allowing a ship to commence taking cargo before the old is entirely out, to prevent becoming too light.

STIFF-HOOK BLOCK. A block with a rigid hook.

Stiles. The up-and-down pieces in a section of a bulk-head, or those that form the two sides of it. The rails lie across and are tenoned into the stiles. When the panels would be too large, or out of proportion, to fill in wholly between the stiles, pieces called munnions are placed between them in the same direction, and tenoned into the rails.

Still Water. Water not agitated by currents or tides. Slack-tide.

Sting-bull. A fish of the genus *Trachinus* (*T. draco*), which is capable of inflicting severe wounds with the spinous rays of its dorsal fins.

Sting-ray. The *Trygon pastinaca*, a fish with a saw-like bone on the upper side of the tail, which wounds, but does not poison.

Stink-balls. Balls carrying an offensive preparation of pitch, rosin, gunpowder, assafœtida, and colophony, formerly thrown on decks at close quarters.

Stink-pots. Earthen jars charged with a similar mixture to that in stink-balls, and also with hand-grenades, to throw on an enemy's decks.

Stirrup. A short rope, hanging from the yard, with a thimble in the lower end, through which the foot-rope is rove; they are lashed to the iron jack-stay on the yard. An iron plate joining the keel and stern-post, and bolted through them; called also *stirrup-plate.*

Stirrup-plate. See STIRRUP.

Stoach-way (*Eng.*). A small stream of water running through the sand or mud at low-tide.

Stoak. To choke up the timbers so that the pump will not empty the bilge.

Stock. A cross-beam of wood or iron at right angles to the shank of an anchor. The wooden part of a musket, carbine, or pistol. In block-making, a wooden tool having a bit at one end, and a pin with a flat head at the other end. *To stock to*, to pull the anchor stock in an upright position on the bows, by the stock-tackle.

STOCK-AND-BILL TACKLE, or STOCK-TACKLE. A tackle used across the forecastle for the purpose of stowing the anchor, or getting the stock upright, and the flukes on the *bill-board.*

Stock-fish. Cod dried in the sun without salt.

Stockholm, the capital of Sweden, is beauti-

fully situated between Lake Maelar and the Baltic. It stands partly on the north and south sides of the strait, between the lake and the sea, and partly on several islands. A strong citadel has been erected on the small island of Kastellholm, while the fortifications of Waxholm have been so strengthened as to command the only channel by which a hostile approach by sea could be attempted. Among the educational establishments are a technological institute, medical college, and a school of navigation. The harbor, though somewhat difficult of access, is capacious, and has depth of water sufficient for the largest vessels at its quays. It has a considerable foreign, inland, and coastwise trade. Lat. 59° 20′ 36″ N.; lon. 18° 3′ 45″ E. Pop. 166,000.

Stocks. A place properly arranged on the shore of a river or bay, upon which a vessel is to be built. It consists of a number of wooden blocks ranged parallel to each other at convenient distances, with a gradual decline toward the water.

Stockton, Robert Field, Commodore U.S.N. Born at Princeton, N. J., 1796; died there October 7, 1866. A.M. of New Jersey College, 1820. He left New Jersey College in his 15th year; entered the navy as midshipman, September 1, 1811; received honorable notice for gallantry in several battles; was made lieutenant, December 9, 1814; commander, May 27, 1830; captain, December 8, 1838; resigned, May 28, 1850. In 1815, while first lieutenant of the "Spitfire," he distinguished himself by boarding with a boat's crew an Algerine war-vessel. Ordered in 1821 to the coast of Africa, he obtained by treaty from the native chiefs the tract constituting the present republic of Liberia. He also captured many slavers, and a Portuguese privateer of 22 guns. On his return he was successful in breaking up the nests of many West India pirates. In 1826–38, he took an active part in politics in favor of Gen. Jackson, and also in aiding internal improvements in his State. In 1838, he was flag-officer of the "Ohio" in the Mediterranean. He was one of the first to advocate a steam navy; and the "Princeton," built according to his plans in 1842, furnished the model for numerous other vessels. By the explosion of one of her large guns, February 28, 1844, Commodore Stockton was seriously injured. Sent to the Pacific in October, 1845; he with 1500 men, including 600 sailors, in about 6 months conquered the whole of California, and established the authority of the United States there. Forming a provisional government, he returned to the East in June, 1847. The difficulty between him and Gen. Kearney in relation to the supreme command there was subsequently made the subject of a court-martial. U. S. Senator in 1851–53, he strenuously opposed intervention in favor of Hungary, and procured the passage of a law for the abolition of flogging in the navy.

Stoer-mackerel (*Eng.*). The young tunny-fish.

Stoke. To tend the furnace-fires, or the galley-fire. To frequent the galley; to loaf about it.

STOKE-HOLE. The space in front of a steam-boiler from which the fires are managed. See FIRE-ROOM.

STOKER. A fireman in a steam-vessel. One who attends the fires in a furnace. See FIREMAN.

Stonacre (*Eng.*). A sloop-rigged boat for carrying stone.

Stool. A channel abaft the main channel for backstays. A chock under the lower stem-transom, to which the lower ends of the fashion-pieces are fastened. The ornamental block which was formerly placed over the stem for a poop-lantern.

Stop. A small projection at the head of a lower-mast, supporting the *trestle-trees.* A small line used to tie up anything. *Clothes-stops*, small laniards fastened to clothing, to hang it by when washed. *Hammock-stops*, laniards on hammocks for the same purpose. *Awning-stops*, short rope-ends spliced into the ridge of an awning, to serve to tie it when furled. *Awning side-stops*, small lines to haul the edge of an awning out to the ridge-rope. *To stop*, to lash anything temporarily with a piece of small-stuff. To close, as to stop a leak.

STOP HER! An order to stop the engines.

STOP-VALVE. A tight-closing valve attached to a steam-boiler or engine for the purpose of isolating one boiler from steam communication with others, or for thoroughly excluding steam from the engine.

STOP-WATER. An object towed overboard, checking the ship's way. A treenail.

Stopper. A short piece of rope, secured to a bolt, or to any point near a running rope, and used to check the motion of the latter by its friction when wound about it. The ends of stoppers are usually unlaid, and plaited up, so as to make them soft and pliable.

Ropes, or more frequently chains, fastening the anchor in place on the bow.

A rope, chain, or mechanical contrivance serving to arrest the motion of a cable, or to prevent its running out when at anchor. These are of various kinds. *Deck-stoppers*, *laniard-stoppers*, or *rope-stoppers*, are short pieces of rope, having a large knot in one end, and a rope laniard, of smaller dimensions, and in the other end a large hook or shackle for hooking it into a bolt in the deck. The laniard is wound about the cable and stopper, and the knot keeps it from slipping. *Dog-stoppers* are strong ropes fastened to the mainmast, hatch, bitts, etc., to assist the deck-stoppers. When at the bitts, they are *bitt-stoppers;* when in the hatches, *hatch-stoppers;* and when secured to the knees in the wings of large vessels, *wing-stoppers.* *Ring-stoppers* are pieces of rope unlaid and plaited, whose bight is fastened about a ring in the deck, while the ends are wound about the cable. Iron stoppers are used, as *hatch-stoppers* in the corners of the hatches, and *compressors* on the berth-deck, at the bottom of the chain-pipes. Both these are curved iron levers, worked by a tackle, which compress the chain-cable and stop it. A *slip-stopper* consists of two or three short links of chain, shackled or bolted to an eye-bolt or ring-bolt in the deck, with a slip-shackle at the other end. *Check-stoppers* are pieces of rope fastened to a chain, which part by the strain, but check the cable in so doing. *Mechanical*, or *patent stoppers*, are contrivances for arresting the motion of the cable. Many have been devised, but the more common one, *Mix's stopper*, serves as a type of them all. It is an iron casting in a wooden frame, in two parts. The upper part is worked by a screw from above. By screwing it down on the lower part,

but one link is held in the casting, and the next link is stopped. A *lever stopper* is on the same principle, a casting holding but one link, but only while the chain is quiescent, there being no upper piece to hold it in place.

An assemblage of ropes and dead-eyes, used to secure rigging when it has parted. (See FIGHTING STOPPERS.) *To stopper*, to arrest the motion of a running rope, cable, etc., with a stopper.

STOPPER-BOLTS. Large ring-bolts driven through the deck and beam.

STOPPER-KNOT. A knot in the end of a deck-stopper, made by double-walling the end of the rope.

STOPPER-LANIARD. The rope fastened to the head of a stopper. The rope uniting the dead-eyes in a fighting stopper.

STOPPING-UP-PIECES. The middle pieces supporting a ship on the cradle in launching.

Stores. Supplies of any kind.

STORE, or STORE-HOUSE. A house in a navy-yard where any property is stored.

STORE-KEEPER (*Eng.*). An officer in a dock-yard, in charge of all stores and all store-houses. A person superintending a store-house in a navy-yard.

STORE-ROOM. A room in the hold, or on the lower or orlop-deck of a ship, in which stores are placed. *General store-room*, a room in the fore-peak, containing spare articles, iron castings, blocks, rope, duplicate tools, etc. It is under the charge of the yeoman.

STORE-SHIP. A government vessel used for carrying stores, or for storing them away in foreign ports.

Storm. A violent disturbance of the atmosphere, producing wind, rain, snow, hail, sleet, etc. *Wind-storms* are direct, as hurricanes, tempests, etc., or *revolving*, by far the greater number belonging to the latter class. *To storm*, to assault a fortified place by open force.

Storm, Revolving (Hurricane, Typhoon, Cyclone, etc.). *Definition.*—A disturbed condition of the atmosphere extending over a circular area varying in diameter (according to the locality where it occurs) from 50 to 1000 miles, within the limits of which currents of air move with the extraordinary velocity of from 80 to 130 miles an hour around a central calm-space of low atmospheric pressure; while at the same time the whole storm-area moves forward on a track, either straight or curved, at the rate of from 1 to 43 miles an hour.

History of Storms.—The history of this phenomenon (which for the sake of brevity I will call cyclone) dates back nearly 200 years, and the first authentic information on the subject was published in England ("Philosophical Transactions," October, 1698), in a paper on the West India hurricanes, by Capt. Langford, in which paper he speaks of a storm as a whirlwind; describes the veering of the wind within the storm area, and refers to a progressive movement of the storm itself.

The Spanish navigator, Don Juan d'Ulloa, during a cruise on the Pacific coast of South America in the year 1743, experienced several storms in which the wind changed from north to west* (which would occur in the northeast quadrant of a cyclone in the southern hemisphere traveling southward and eastward).

In 1801, Col. James Capper published a work entitled "Observations on the Winds and Monsoons," in which he speaks of great whirlwinds on the Coromandel coast, the centres of which pass generally near Madras or Pulicat, and whose diameter, he says, cannot exceed 120 miles.

A French writer named Romme, in a work entitled "Tableaux des vents, des marées et des courans," published in 1806, describes storms in the China Sea near the Gulf of Tonkin, which he distinctly calls whirlwinds, and applies the same name to other storms experienced in the Mozambique Channel, and again others in the Gulf of Mexico.

Professor Farrar, of the Cambridge University, Mass., in describing a storm that passed over Boston on September 23, 1815 (the account of which was published in the "American Philosophical Transactions," 1819), says that he could not determine the place of the centre or the limits of this storm, but noticed the veering of the wind, and the fact that it veered in opposite directions at Boston and New York at the same time.

In the year 1831, Mr. William Redfield, an American philosopher, published in the *American Journal of Science* a paper, in which he demonstrated not only that the storms on the American coast were whirlwinds, but also that they had a progressive or forward movement, traveling on curved tracks at a considerable rate, and were traceable from the West Indies, along the coast of the United States, curving off to the eastward at some point between the Bermudas and the banks of Newfoundland.

While Mr. Redfield was employed collecting the data from which he eventually deduced his law of storms, a similar investigation was going on in Germany. A number of gales had attracted the attention of German meteorologists, chiefly on account of the oscillations and great fall of the barometer before and during these gales. On Christmas-eve, 1821, the barometer sank so low that many people believed their barometers were out of order, and others, who were not mistaken as to the cause, expected a great catastrophe.

Professor Brandes, a German meteorologist, who had kept a record of observations for a length of time, obtained the registers kept at various places during the same time, and eventually advanced a theory that the winds, during these great storms, blew from all points of the compass in straight lines toward a central space where the barometer was for the time at its lowest stand. (See Fig. 1.)

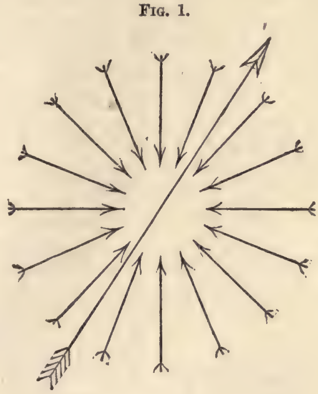
The theory of Mr. Brandes was disputed by Professor Dove, of Berlin, who subjected the observations to a new examination, and made it appear that an explanation of all the phenomena was afforded by the assumption of one or more circular currents or whirlwinds of great diameters, advancing from southwest to northeast. A full account of this is found on page 162, "Dove's Law of Storms," 2d edition, 1862. (See Fig. 2.)

Professor Dove's theory, although under discussion about the same time that Mr. Redfield by an independent course of investigation arrived at the results above mentioned, was not known

* Piddington, p. 82, and "Dove's Law of Storms," p. 108.

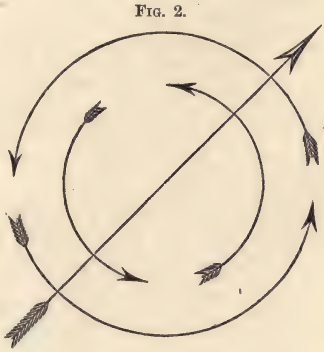
in the United States when the latter gentleman published his paper in the *American Journal of*

Fig. 1.



Science, and an eminent English philosopher, Sir David Brewster, is accredited with saying

Fig. 2.



in connection with Redfield's discovery, "The theory of rotary storms was first suggested by Col. Capper, but we must claim for Mr. Redfield the greater honor of having fully investigated the subject, and apparently established the theory upon an impregnable basis. Mr. Redfield had no knowledge of Col. Capper's discovery when he published his own in 1831."*

In the year 1838, Lieut.-Col. Reid, of the royal engineers, published a valuable work entitled "Reid on the Law of Storms," in which he agreed in all particulars with the views of Redfield, and verified by personal observation all his theory; adding many substantial proofs to the same by investigations of some of the West India hurricanes, and of some in the Southern Indian Ocean.

Col. Reid by his observations of storms in this latter sea further proves Mr. Redfield's theory, that the storms in the southern hemisphere revolve in a contrary direction to those in the northern hemisphere. Col. Reid embodied in his work many useful rules for manœuvring in a revolving storm, and thus may be said to have reduced the science from a mere speculative theory to a practical law; and the recorded experience of hundreds of able and observing men who have carefully and intelligently noted and studied the course and gradual veering of the wind within the limits of the storm-disk goes to prove that correct conclusions have been arrived at in this respect.

Origin of Storms.—With respect to the cause or origin of cyclones we are still comparatively in the dark, but as it is not the purpose of this article to deal with abstract theories or to discuss doubtful scientific questions, I shall confine myself to a brief recital of the opinions of a few gentlemen who appear to have given the subject careful consideration, and spent much time and labor in the prosecution of their investigations.

Mr. Redfield appears to have had no particular theory as to the causes of cyclones; he thought it would be unscientific to attempt to account for them, until better informed, by the exclusive action of any one or more causes. Later, however, he inclines to think them produced by the conflicts of prevailing currents in the different strata of the atmosphere giving rise to circular movements, which increase and dilate to storms.

Col. Reid avoids any general speculation as to the causes of cyclones. He adverts to the possibility of there being some connection between storms and electricity and magnetism, and concludes with an account of an experiment with a 10-inch hollow shot, which, he thinks, partly confirms his views.†

Professor Dove accounts for cyclones by currents of air near the equator being from any cause set in motion toward the poles and coming in contact with other currents moving in a different direction.‡

Mr. Piddington, the author of the "Sailor's Hornbook," in the third edition of that work (1860), pp. 324, 325, gives it as his opinion that cyclones are purely electrical phenomena formed in the higher regions of the atmosphere, and descending in a flattened disk-like shape to the surface of the ocean, where they progress more or less rapidly, according to circumstances. He thinks that whirlwinds, dust-storms, and waterspouts are the same meteor in a concentrated form, but cannot say where the law which regulates the motions of the larger kinds ceases to be an invariable one.

The views of Sir John Herschel on the causes of cyclones, says Mr. Piddington ("Sailor's Hornbook," page 21), may be briefly stated as follows:

"It seems worth inquiry whether hurricanes in tropical climates may not arise from portions of the upper currents prematurely diverted downwards before their relative velocity has been sufficiently reduced by friction on, and gradually mixing with, the lower strata; and so dashing upon the earth with that tremendous velocity which gives them their destructive character and of which hardly any rational account has yet been given. Their course, generally speaking, is in opposition to the regular trade-winds, as it ought to be in conformity with this idea." He then goes on to say that it does not follow that this must always be the case, for, "in general, a rapid transfer, either way in latitude, of any mass of air which local or tempo-

* "Reid on the Law of Storms," 3d edition, 1850, p. 2.

† "Reid on the Law of Storms," 3d edition, 1850, p. 490.

‡ "Dove's Law of Storms," 2d edition, 1862, p. 182.

rary causes might carry above the immediate reach of the friction of the earth's surface, would give a fearful exaggeration to its velocity. Wherever such a mass should strike the earth a hurricane might arise, and should two such masses encounter in mid-air, a tornado of any degree of intensity on record might easily result from their combination."

Sir John Herschel also alludes to the possibility of the meeting of two atmospheric undulations or barometric waves traveling in different directions, producing a storm and giving a rotary motion to the wind.

Professor Espy, an American philosopher, in his fourth meteorological report, 1857, page 11, gives as one of the causes of storms the following: Upon any partial heating of the air at the surface of the earth it rises in columns more or less charged with vapor, which as they rise have their vapor condensed into clouds or rain. Next in this changing of state the vapor communicates its latent caloric to the surrounding air, which also expands, is cooled itself by that expansion, but also gives heat to that part of the air in which it is then, and becoming lighter, is carried farther up. In short, Mr. Espy considers the centre of the storm the base of a huge moving chimney, circular, or of any longitudinal shape, the draft of which is occasioned by an extensive condensation of vapor above.

Dr. Alexander Thom, in a work on storms in the Indian Ocean, south of the equator, gives it as his opinion that circular motion is given to the winds in a storm-area by the contact in meeting on the borders of the monsoons and trade-winds of opposing currents of air, differing in temperature, humidity, specific gravity, and electricity. These, he thinks, give rise to a revolving action which originates the storm.

It is believed by some that cyclones originate at great volcanic centres, and Mr. Henry Piddington is among that number. On page 23, "Sailor's Hornbook," I find the following: "If we produce at both ends the line of the track of the Cuba cyclone of 1844, we shall find that it extends from the great and highly active volcano of Cosseguina, on the Pacific shore of Central America, to Hecla, in Iceland. And in 1821, the breaking out of the great volcano of Eyafjeld Yokul, in Iceland, which had been quiet since 1612, was followed all over Europe by dreadful storms of wind, hail, and rain."

A late writer (Professor Silas Bent), in an article published in the St. Louis *Republican*, November 3, 1878, gives a very interesting solution of the cyclone problem, attributing the motion of the winds within the storm-disk to the earth's rotation on its axis.

For full information on the subject, see the standard works of Redfield, Reed, Dove, and Piddington, already referred to. Also the works of Professors Loomis and Meldrum; "Atmospheric Changes," etc., by Thomas Hopkins; Report of Dr. H. P. Baddeley on "Electric Experiments at Lahore, India, in 1847–50;" Piddington, p. 303; "Etude sur les Ouragans de l'Hemisphére Austral" (2e série), par M. Bridet; "Die Wirbelstürme, Tornados und Wettersäulen," p. 134; and "U. S. Naval Institute Proceedings," vol. v. pp. 236–238.

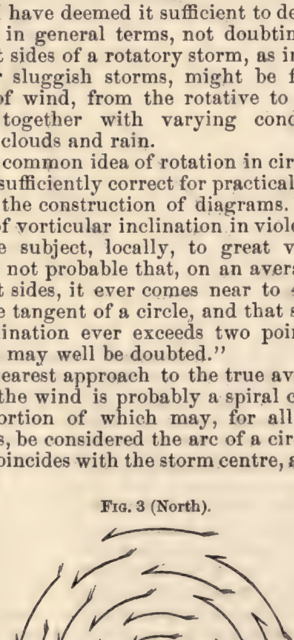
Law of Storms.—The theory of motion of the winds within the storm-area and the progressive movement of the storm, discovered by Redfield and Dove, verified by Col. Reid, and confirmed since its publication by numberless actual observations at sea, is commonly known as The Law of Storms, and is based on the supposition that the air-currents within the limits of the storm-disk move in nearly concentric circles round a centre of low pressure; from right to left, or against the hands of a watch (face up) in the northern hemisphere, and from left to right, or with the hands of a watch, in the southern hemisphere; so that, when facing the wind, the centre lies on the right hand in the northern, and on the left hand in the southern hemisphere.

It must, however, be remembered in this connection that the author of the cyclone theory does not claim that the winds blow uniformly in circles; it is well known that certain irregularities in the course of the winds due to local disturbances frequently take place within the storm-disk, and Mr. Redfield, in the *American Journal of Science and the Arts*, second series, No. 1, page 14, says,* "When, in 1830, I first attempted to establish, by direct evidence, the rotative character of gales or tempests, I had only to encounter the then prevailing idea of a general rectilinear movement in these winds. Hence I have deemed it sufficient to describe the rotation in general terms, not doubting that on different sides of a rotatory storm, as in common rains or sluggish storms, might be found any course of wind, from the rotative to the rectilinear, together with varying conditions as regards clouds and rain.

"The common idea of rotation in circles, however, is sufficiently correct for practical purposes, and for the construction of diagrams. . . . The degree of vorticular inclination in violent storms must be subject, locally, to great variations; but it is not probable that, on an average of the different sides, it ever comes near to 45 degrees from the tangent of a circle, and that such average inclination ever exceeds two points of the compass may well be doubted."

The nearest approach to the true average motion of the wind is probably a spiral curve, any small portion of which may, for all practical purposes, be considered the arc of a circle, whose centre coincides with the storm centre, as in Figs. 3 and 4.

FIG. 3 (North).



The correctness of the circular theory, although generally accepted by seamen who have had

* See also Piddington's "Hornbook," p. 108.

experience at sea and opportunities to observe the changing of the wind, etc., within the actual

Fig. 4 (South).

limits of the storm-disk, is, nevertheless, questioned by several scientific men who appear to have given the subject careful attention.

Thus, Capt. Henry Toynbee, in the report of the British Meteorological Office on the Storms in the North Atlantic, August, 1873, represents the wind on the 25th August as blowing in lines, more or less curved, toward the centre, as shown in Fig. 5. And Mr. Meldrum, from his investigations of the Mauritius hurricane of February 25, 1860, produces a similar figure to represent the movement of the winds in that storm. Fig. 6.

Fig. 5.

Circulation of air, hurricane, August 25, 1873, south of Newfoundland, according to Captain Henry Toynbee.

Fig. 6.

Circulation of air in the Mauritius hurricane, February 25, 1860, according to Mr. Meldrum.

It is stated in the same report (August, 1873), that two days previous, or on the 23d August, the American steamer "Albemarle" hove to north of the centre, and that the captain, finding that he was near the line of the storm-track, subsequently kept the vessel off, and ran with the wind two points on the quarter, N. W. by W., wind E. by S., and thereby cleared the dangerous part of the storm, a fact evidenced by a rise of the mercury and rapid improvement of the weather. A glance at Fig. 5 would make it appear that such a manœuvre was not possible, and it may therefore reasonably be supposed that the diagram does not correctly represent the circulation of air in every storm, and particularly in the one on the 23d of August.

With reference to Mr. Meldrum's diagram of the circulation of air in the Mauritius hurricane of February 25, 1860, we have the report of M. Bridet, *capitaine de frégate*, and captain of the port at St. Denis, that 4 vessels, viz., "l'Angéle," "la Somme," "l'Alfred," and "la Victorine," did cross the track of that storm, and returned to St. Denis and reported the fact.* This feat, according to Mr. Meldrum's diagram, would have been impossible.

The theory of inblowing or centripetal motion of winds (Fig. 1), advanced by Profs. Brandes and Espy, is sufficiently disproved in practice, as may be seen by the foregoing examples of the "Albermarle" and French vessels above referred to, to require no further comments here.

A paper entitled "The September Taifuns, 1878, in the China and Japan Seas," by E. Knipping, published at Tokio (Yedo), Japan, in July, 1879, gives, among other things in its summary of results, the following: "The centre bore 10 points from the wind within a distance of 400 miles from the centre."

"The bearing of the centre varied with the distance, thus: with N. E., N. W., and S. W. winds, the angle† increased with the distance; while with S. E. winds the reverse was the case."

Distortion of the Storm-disk. — Revolving storms, it is believed, are distinct and separate phenomena, created, existing, and dying in accordance with certain natural laws, for which, as yet, no absolute solution has been found; and further, that when unobstructed in mid-ocean, the winds within the limits of the storm-disk circulate, as nearly as may be, in circles around a centre of low pressure; but that from various causes, such as contact with land,‡ meeting or colliding with another storm,§ or temporarily, from local atmospheric disturbances within the storm-disk, the latter may become so distorted as to render it difficult to determine the position of the centre; and to one or more of the above causes, I believe, may be traced most of the defects complained of in the circular system. The fact of but few storms having reached the Mozambique and Formosa Channels is doubtless due to the effect of the high lands of Madagascar and Formosa Islands in turning the storms off to the eastward; and the same effect would be produced by any other high land having a clear expanse of ocean on the side on which the storms approach. Before, however, the course of a storm is changed by pressure against the land which obstructed its original course the storm-disk must necessarily undergo considerable change in form also, and in such cases the barometer and good judgment are all-important.

Remarks on Barometer.—The barometer as an instrument of warning, and also an approximate measure of the distance from the centre of a cyclone, is of vital importance to the seaman.

First. The barometer generally indicates the approach of a storm by a restless, oscillating motion of the mercury, caused by a disturbed condition of the atmosphere in the vicinity of a storm, and the consequent passage over it of atmospheric waves of different heights. These oscillations have been observed to vary from a just perceptible motion to 0.02 inch. One instance is recorded where the oscillations of the barometer amounted to 0.178 inch.‖

* "Etude sur les Ouragans de l'hemisphére Austral" (second edition), pp. 115 to 137, and "U. S. Naval Institute Proceedings," vol. v. pp. 251–262.

† The angle between the direction of wind and bearing of centre.

‡ See "U. S. Naval Institute Proceedings," vol. v. pp. 250–252.

§ See Piddington's "Hornbook," 4th edition, pp. 96–100.

‖ Ibid., p. 239.

Second. The barometer often rises suddenly just on the border in front of a storm, by reason of the air banking up there; and therefore, if the clouds and general appearance of the weather indicate the approach of a storm, the rise in the barometer, if any occurs, is no guarantee that it will not come, but rather a sign that a severe storm is coming. The barometer will probably not rise much in front of a slowly-moving storm.

Third. A very rapid fall of the barometer after fairly entering the storm-disk may be regarded as evidence of a very violent storm of small diameter, and a gradual fall would indicate the contrary.

Fourth. If a vessel by any accident was caught in a cyclone in a dangerous position near the land, the knowledge of her distance from the centre might be all-important, even if it could not be determined nearer than 50 miles, and to aid navigators in determining probably within that distance,—the distance from the centre,—a table is published in Piddington's "Hornbook," 3d edition, page 252, which I give here for what it is worth, and which, in an extreme case, may prove of service:

Average Fall of Barometer per Hour	Distance in Miles from Centre.
From 0.02 inch to 0.06 inch.	From 250 to 150
" 0.06 " 0.08 "	" 150 " 100
" 0.08 " 0.12 "	" 100 " 80
" 0.12 " 0.15 "	" 80 " 50

I have compared the fall of the barometer in a great number of cases with the above, and generally found the result very favorable.

The following table, from Mr. Knipping's publication, "The September Taifuns, 1878, in the China and Japan Seas," shows, according to his observations, approximately the fall of the barometer corresponding to an approach of 50 miles, according to various distances from centre, as follows:

Mean Distance from Centre in Miles.	Fall of Barometer Corresponding to an approach of 50 Miles.
375	0.07 inch.
325	0.08 "
275	0.09 "
225	0.10 "
175	0.12 "
126	0.14 "
75	0.55 "

The figures in the barometer column, divided by 5, give about the corresponding fall per hour.*

The lowest barometer observed at the sea-level is in the case of the "Duke of York," at Kedgeree, in 1833, when the mercury fell to 26.30 inches. In the case of the "Francis Henty" (bark), in a cyclone near the Linchoten group of islands, China Sea, 1872, the mercury fell out of sight, that is, below the wood of which the barometer case was made, the last reading, about one-half hour before reaching the centre, being 27.19 inches. The greatest fall of the barometer in any one storm occurred in the case of the brig "Gazelle," in the China Sea, 1849, when the mercury fell from 29.80 inches to 27.00 inches, or 2.8 inches.

Storm Indications.—The indications of the approach of a cyclone do not differ materially from those of the ordinary gale; but a few such, as a hard steel-gray sky, or having a greenish tint, a blood-red or bright yellow sunset, a heavy swell, unaccounted for in any other way, and a thick, lurid appearance of the sky, may be regarded in connection with a general threatening appearance of the weather, and particularly with a restless state of the barometer, as significant signs of a more than ordinary gale, and, whether seen separately or together, ought not to be disregarded.

When by any of these signs, or by the action of his barometer, the navigator has reason to suspect that a cyclone is not far distant, his first care is to devise a plan for avoiding it, and if he knew positively the direction of its course, this might sometimes be accomplished. An approximate idea of the storm's movement in certain localities may be had by an inspection of a cyclone chart, such as is found in the standard works on storms; but although the cyclone tracks generally lie in the same direction, and as a rule not very far apart,—probably not more than four or five hundred miles at any given point,—yet it does not follow as matter of course that every cyclone travels over the beaten track, and therefore there is no certainty that the approaching storm will do so. By a knowledge of the tracks in the locality the navigator may, however, try to avoid it; but if after doing his very best to effect this he is still caught in the storm, he must then as quickly as possible determine his position in the storm-disk, and the course of the storm. This, on the basis of Redfield's law of storms, may always be done by a knowledge of the following few simple facts committed to memory, viz.:

Rules for avoiding the Centre.—Right Semicircle: Wind changes to the right, N. E. S. W., heave to on *starboard tack.*

Left Semicircle: Wind changes to the left, N. W. S. E., heave to on *port tack.*

This is all that is necessary to place the ship in a safe position north or south of the equator until the course of the storm is determined. This may further be reduced to *six words*, by associating the direction of the change of wind with the semicircle of the storm and the tack to heave to on,—and taking them in this order we would have for the right semicircle: *Right-Right-Starboard*, and for the left semicircle: *Left-Left-Port.*

The right semicircle is that portion of the storm-disk situated on the right of the axis of the storm-track, looking in the direction of its course, and the left semicircle the portion of the storm-disk lying on the left of that line.

Rotation of wind.—Northern Hemisphere: from *Right to Left.* N. W. S. E., left-handed, or, in nautical language, against the sun.

Southern Hemisphere: from *Left to Right.* N. E. S. W., right-handed, or, as a sailor would say, with the sun.

Bearing of centre.—Northern Hemisphere: 8 points (90°) to the *right* of the wind-point, looking in the wind's eye.

Southern Hemisphere: 8 points (90°) to the *left* of the wind-point, looking in the wind's eye.

* It will be observed that this column, when divided by 5, gives, for distances from the centre corresponding to hourly fall of barometer, results differing considerably from those obtained by the use of Piddington's table; and inasmuch as these results place a vessel nearer to the centre than those from Piddington's table, they ought, perhaps, as a measure of prudence, to be preferred.

Two bearings of the centre, with an interval of from 2 to 3 hours between, will in general be sufficient to determine the course of the storm, provided an accurate account has been kept of the ship's way; but if the storm is moving slowly a longer interval may be necessary. There are but two points in the storm-disk of a cyclone where a vessel hove to will not experience a change of wind,—one is in front of the centre on the line of its axis, and the other in rear of the centre on the same line; for these two cases the barometer must be the guide,—in front of the centre it falls, and in rear of the centre it rises.

There are also five points in the storm-disk of a cyclone where a vessel may run along with the storm parallel to its course, and at equal speed, without having any change of wind, and with a steady barometer.

Northern Hemisphere.—1st. *In front of the centre on the line of its axis.* Wind on starboard beam.

2d. *Anywhere in the right forward quadrant.* Wind on starboard side abaft the beam.

3d. *In rear of centre on the line of its axis.* Wind on port beam.

4th. *Anywhere in the right rear quadrant.* Wind on port side abaft the beam.

5th. *Abreast and to the right of the centre.* Wind aft.

Southern Hemisphere.—1st. *In front of centre on the line of its axis.* Wind on port beam.

2d. *Anywhere in the left forward quadrant.* Wind on port side abaft the beam.

3d. *In rear of centre on the line of its axis.* Wind on starboard beam.

4th. *Anywhere in the left rear quadrant.* Wind on starboard side abaft the beam.

5th. *Abreast and to the left of centre.* Wind aft.

The above manœuvres are possible providing sail can be carried, but only three of them are advisable, viz.: the position abreast of the centre, in the rear quadrant, and in rear of the centre. Running along with the storm in front of the centre, or in the forward quadrants, should never be resorted to, as an accident to sails or spars, temporarily disabling the vessel, would at once place her in great danger of being overtaken by the centre.

*To run out of the storm in the Northern Hemisphere.**—Right Semicircle: Haul by the wind *on starboard tack*, and carry sail as long as possible; if obliged to heave to, do so on *starboard tack.*

Left Semicircle: Bring the wind on *starboard quarter.* Note the direction of the ship's head and steer that course. If obliged to heave to, do so on *port tack.*

On the storm-track in front of centre: Square away and *run before it.* Note the course and keep it, and trim the yards when the wind draws on the starboard quarter. If, however, obliged to heave to, do so on *port tack.*

On the storm-track in rear of centre: *Run out* with wind on *starboard quarter*, or heave to on *starboard tack.*

To run out of the storm—Southern Hemisphere.†—Right Semicircle: Bring wind on *port quarter.* Note the course and keep it. If obliged to heave to, do so on *starboard tack.*

Left Semicircle: Haul by the wind on *port tack.* Carry sail as long as possible, and if obliged to heave to, do so on *port tack.*

On the storm-track in front of centre: *Run before it.* Note the course and keep it, and trim the yards as the wind gradually hauls on the port quarter. If obliged to heave to, do so on *starboard tack.*

On the storm-track in rear of centre: *Run out* with the wind on port quarter, or heave to on *port tack.*

A rise of the barometer, improvement of the weather, and a gradual abatement of the force of the wind will result from the above manœuvres; and the ship should in each case be kept on her course until by these signs it is made evident that she is out of danger.

All the above manœuvres depend of course on sea-room, and the ability to carry sail. If sail cannot be carried, or land interferes, the ship must be hove to on the *starboard* tack in the *Right* semicircle, and on the *port* tack in *Left* semicircle, and never otherwise. The old popular idea of heaving to on the starboard tack in the northern hemisphere, and on the port tack in the southern hemisphere, under all circumstances, is dangerous practice and may lead to serious consequences.

It sometimes occurs, although the cases are very rare, that a cyclone takes a sudden turn, and recurves on its track so much as to render a vessel liable to run into it a second time. See "Reid on the Law of Storms," p. 173.

The results of the manœuvres herein recommended should, as before stated, be a rising barometer and improvement in the weather. If, however, the barometer continues to fall, or remains stationary, and the weather becomes either worse or remains the same, it is evidence that the indraft is very great, and in either case the ship should be hauled up as near the wind as possible under the circumstances of wind and sea, and so kept until a decided rise of the mercury and improvement in the weather take place.

Thus the barometer is always a measure of safety, even when the rules laid down for avoiding the centre fail to carry a vessel out of the dangerous part of the storm.

In a very extreme case of indraft, where it is found impracticable to distance the centre by sailing, the vessel should be prepared for a *heavy blow*, and hove to on the proper tack, until either the centre has passed or an opportunity occurs (by a change in the wind) for avoiding it.

Storm-Tracks.—For a correct idea of the tracks generally followed by revolving storms in different parts of the world, reference should be had to the track charts published by Henry Piddington, accompanying the "Sailor's Hornbook."

Velocity or Rate of Travel.—The rate or velocity of translation of revolving storms over their tracks varies not only in different localities, but in storms passing over the same locality, and even in one and the same storm during different stages of its existence. It is generally believed that storms when they originate are nearly stationary, and that after being fully formed they acquire a forward or progressive

* See Storm Card, Northern Hemisphere. Fig. 8.
† See Storm Card, Southern Hemisphere. Fig. 7.

FIG. 7.

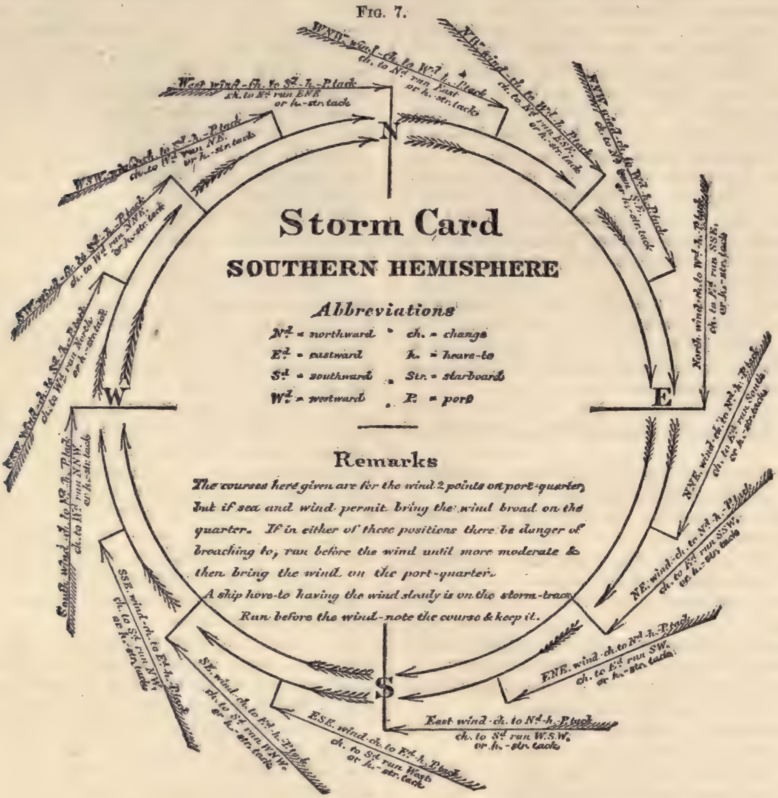
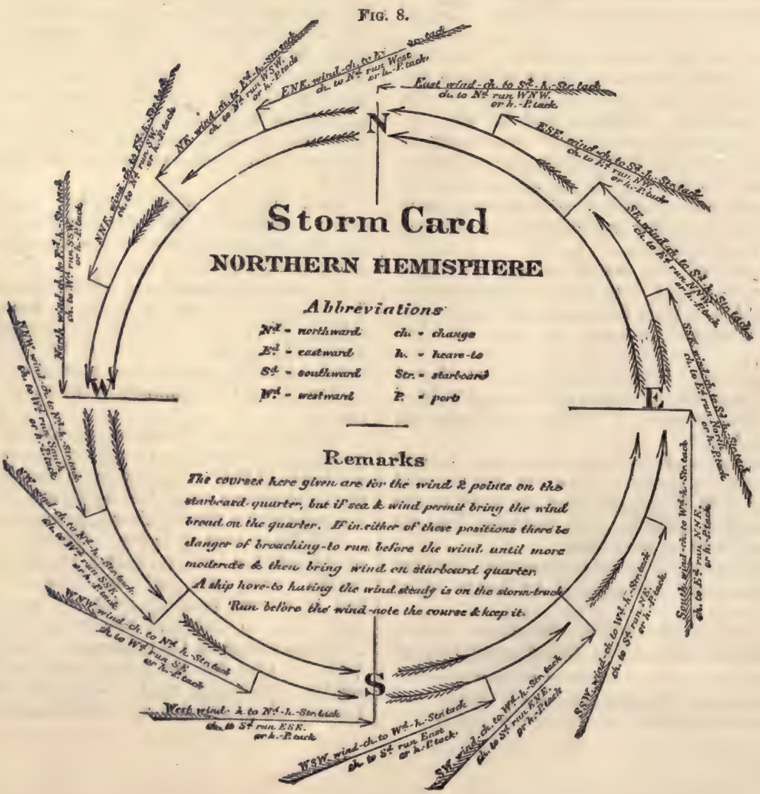

Storm Card
SOUTHERN HEMISPHERE
Abbreviations
Nd. = northward
Ed. = eastward
Sd. = southward
Wd. = westward
ch. = change
h. = heave-to
Str. = starboard
P. = port
Remarks
The courses here given are for the wind 2 points on port-quarter, but if sea and wind permit bring the wind broad on the quarter. If in either of these positions there be danger of broaching to, run before the wind until more moderate & then bring the wind on the port-quarter.
A ship hove-to having the wind steady is on the storm-track.
Run before the wind—note the course & keep it.
N
E
S
W

FIG. 8.


Storm Card
NORTHERN HEMISPHERE
Abbreviations
Nd. = northward
Ed. = eastward
Sd. = southward
Wd. = westward
ch. = change
h. = heave-to
Str. = starboard
P. = port
Remarks
The courses here given are for the wind 2 points on the starboard-quarter, but if sea & wind permit bring the wind broad on the quarter. If in either of these positions there be danger of broaching-to run before the wind until more moderate & then bring wind on starboard quarter.
A ship hove-to having the wind steady is on the storm-track.
Run before the wind—note the course & keep it.
N
E
S
W

movement, which increases more or less rapidly according to the locality in which they blow.

The idea of a uniform increase in the forward or progressive movement of storms cannot, however, be sustained by evidence. Experience, to the contrary, shows that the velocities of translation of particular storms have varied irregularly, increasing and decreasing at different portions of their tracks.

The following table of mean, lowest, and highest velocities, compiled from Piddington's "Sailor's Hornbook," may, however, as far as it goes, serve as a guide to the navigator, who, for practical purposes, desires to ascertain the probable rate of movement of a coming storm:

Locality.	Velocity in Miles per hour.			Remarks.
	Mean.	Lowest.	Highest.	
Atlantic (North)	25.	9.5	43.	This high rate refers to the Cuba hurricane of 1844.
Arabian Sea......	10.	4.0	16.	
Bay of Bengal....	9.	3.0	39.	This high rate occurred only in one instance. From 3 to 15 miles per hour may be taken as the usual rates.
China Seas........	15.	7.0	24.	
Indian Ocean (South).........	5.	0.5	10.	Col. Reid assigns to a cyclone which occurred in 1809 near the Mauritius a velocity varying from 7 to 12½ miles per day.

There does not appear to be at hand sufficient data for the determination of rates for other parts of the world.

Dimensions.—The storms in the Atlantic (North) are said to commence with a diameter of from 100 to 150 miles, and then to increase to 600 or 1000 miles; a fair average is, perhaps, 500 miles. In the Arabian Sea they probably do not exceed 240 miles. In the Bay of Bengal they are from 300 to 350 miles in diameter. In the South Indian Ocean from 150 to 600 miles, and in the China Seas from 80 to 350, and possibly as high as 600 miles.*

Storm Seasons.—The period of the year during which cyclones are most frequent may in a general way be considered. In north latitude, from June to November; August and September being the worst months. In south latitude, from September to May; February and March being the worst months. In other words, the cyclone season appears to correspond to the time when the sun is nearing the equator, on his return from his highest declination in either hemisphere.—*Thomas Nelson, Lieutenant-Commander U.S.N.*

STORM-BREEDER. Heavy cumulo-stratus clouds; also, dark, threatening, cumulo-nimbus clouds. A *weather-breeder.*

STORM-DRUM. A canvas cylinder hoisted in English ports on the approach of a storm.

STORM-FINCH. The *Mother Carey's chicken.*

* See "U. S. Naval Institute Proceedings," vol. v. p. 242.

STORM-FLAG. A flag, red with a white square in the centre, hoisted in American ports on the probability of a storm.

STORM-JIB. The inner jib of square-rigged ships. A strong jib, bent in bad weather. A fifth size of jib, used in cutters.

STORM-KITE. A kite for sending a hawser to a stranded vessel.

STORM-MIZZEN. A triangular storm-sail of stout canvas, bent to the spanker-mast, and used in lying to.

STORM-SAIL. A sail of heavy canvas, bent and set during a storm when lying to. The storm-sails are the *fore-storm-stay-sail*, the *main-storm-stay-sail*, the *mizzen-storm-stay-sail*, and the *storm-mizzen.* The main-trysail and the main-topsail are also used as storm-sails, and also the foresail.

STORM-SIGNAL. A signal hoisted on shore to warn mariners of an approaching storm.

STORM-STAY. A stay for a storm-sail.

STORM-WARNING. See FORECAST.

STORM-WAVES. The waves that precede or follow a storm.

STORMY-PETREL, or STORM-PETREL. The *Mother Carey's chicken*, a small bird of the genus *Procellaria.* See PETREL.

Stove. *Boat stoves* are small stoves for use in boat expeditions, neatly packed in a box. *Hanging stoves*, or *drying stoves*, are small charcoal stoves used for drying decks. *Stove in*, broken in,—applied particularly to a fracture of the casing of a ship caused by collision, grounding, etc. If, on grounding, the bottom is fractured, the ship is said to be *bilged.*

Stow. To put in place or position. *To stow the hold*, to arrange the stores or cargo properly in the hold. *To stow a sail*, to furl or pack it neatly on the yard or in the netting. Stay-sails are *stowed*, other sails *furled. To stow the anchor*, to get it up in place. *To stow the cargo*, to get it on board and properly dispose of it. *To stow the hammocks*, to place them in the nettings. *To stow in bulk*, to stow goods without any packages, as grain, etc. *To stow in bale*, to stow goods in packages.

STOWAGE. The art of properly arranging and disposing the weights in a ship's hold, so that the qualities of the ship shall be the best possible. Reference must be had to stability, speed, easiness of motion, economy of space, and convenience of access. The trim must be accurately preserved, and great weights kept as near the centre as possible.

STOWING-STRAKE. A stealer.

Straggler. See DESERTER.

STRAGGLING-MONEY (*Eng.*). A reward paid for the apprehension of stragglers.

Straight of Breadth. The space before and abaft the midship frame of a ship which does not taper, or is all of the same breadth.

Strain-bands. Bands of canvas across a sail, to take a part of the strain.

Strait. A narrow passage between two bodies of water. See SOUND.

STRAIT-GULF. A gulf with a narrow entrance.

Strake. One breadth of plank, worked from one end of the ship to the other.

Strakes of plank have various names according to their position. The *wales* are those strakes which are worked from the water-line or there-

abouts to the plank-sheer, or lower port-sill. The *bottom-planking* is the name for the strakes from the lower edge of the wales to the garboard-strake. The *garboard-strake* is the name of the strake which comes next to the keel on the outside. The *ceiling* is the name of the strakes worked below the lower deck-clamps. The *bilge-strakes* and *thick strakes* are the strakes worked at the bilge, and are made heavy to support the ship, in taking ground. The *limber-strakes* are those next the keelson. The lower deck *clamps* are the strakes worked from the lower edge of the lower deck-beams to the lower ends of the hanging-knees. The *spirketing* is the two strakes above the water-ways. The upper deck-clamps and ceiling occupy the space between the spirketing and the bottom of the upper deck-beams. *Stringers* fill the space from the port-sill to the plank-sheer. *Thick-strakes* are worked on the deck-beams next the water-ways, and are bolted to the water-ways as well as to the beams. *Strakes of the deck* are the deck-planking, all over the ship.

Strand. A number of rope-yarns twisted together. One of the primary assemblages of wire in a wire-rope. The sea-beach; the shore. *To strand*, to break one of the strands of a rope. To run a ship ashore, on the beach. To drift or be driven ashore.

Strange Sail. A vessel sighted whose nationality, character, etc., are not known

Strap. A shoulder-strap. A band of iron used to connect or hold parts together. A ring of rope, or a binding of iron, put on a block. A piece of rope, spliced to form a ring, used to sling heavy weights, etc., or serving to attach a tackle to any object, etc. A circular, or curved iron band, used for various purposes about a steam-engine.

STRAP-HEAD. A journal-box at the end of a connecting-rod.

Stratus. See CLOUD.

Stray-line. The portion of the log-line which is veered from the reel to allow the chip to get clear of the eddies under the stern, before the glass is turned.

Stray-mark. The mark noting the extent of stray-line.

Streak. A *strake.*

Stream. Flowing water, as a *tide-stream*, the *stream of a current*, etc. *To stream the buoy*, to cast the buoy, attached to the anchor, overboard, previous to letting go the anchor. See GULF STREAM.

STREAM-ANCHOR. An anchor, from one-fourth to one-third the size of the bowers, stowed in the hold or on deck, and used for warping, clubbing, etc. See ANCHOR.

STREAM-CABLE. A cable used with the stream-anchor. In the navy, chain stream-cables are about two-thirds as long as bower-cables, and the links are one-half the diameter of those of the latter.

STREAM-ICE. Drift- or bay-ice, forming and flowing in a current.

STREAM-LAKE (*Eng.*). A lake emptying into the sea by a river.

Streamer. A long and narrow flag, terminating in a point.

Stress of Weather. Continued and sustained violence of the elements.

Stretch. The distance sailed on one tack. To sail by the wind under press of canvas. *To stretch out*, to extend the stroke, and increase the muscular force in rowing.

Stretcher. A sheer-pole. A narrow foot-piece in a boat for an oarsman. A cross-piece put in the slings of a boat, to prevent crushing the sides. A stick placed between the clews of a hammock, to extend them. Jocularly, a lie; a tough yarn.

Stribling, Cornelius K., Rear-Admiral U.S.N. Born in South Carolina. Appointed midshipman from same State, June 18, 1812; served on board the "Macedonian" from January 1, 1813, to April, 1814, and "Mohawk," on Lake Ontario, until April, 1815, and in "Macedonian," in the squadron under the command of Commodore Decatur, when the Algerine frigate and brig were captured, in 1815; from "Macedonian" to "Constellation" in October, 1815, and returned to the United States in "Constellation," end of 1817.

Commissioned as lieutenant, April 1, 1818; on board the "Constellation," on coast of South America, 1819–20; in the West Indies, on board the "Hornet," "Peacock," "John Adams," and "Constellation," 1822–25; in April, 1823, commanded two barges on the coast of Cuba, and after a running fight, captured the piratical schooner "Pilot"; on board the "Brandywine," Pacific Squadron, 1826–27, and sloop "Vincennes," 1827–31; receiving-ship "Norfolk," 1831–33; assistant inspector of ordnance, 1833–35; sloop-of-war "Peacock," East India and Pacific Squadrons, 1835–37; rendezvous, Norfolk, 1840.

Commissioned as commander in 1840; commanding rendezvous, Norfolk, 1840; navy-yard, Washington, 1840–41; commanding sloop-of-war "Cyane," 1841–44; Pacific Squadron, frigate "United States," 1844; receiving-ship "Norfolk," 1845–47; fleet-captain, Pacific Squadron, 1847–48; commanding ship-of-the-line "Ohio," 1848–50; superintendent of the Naval Academy, 1850–53.

Commissioned as captain, August 1, 1853; commanding sloop-of-war "San Jacinto," special service, 1854–55; commandant Pensacola Navy-Yard, 1857–59; commanding East India Squadron, 1859–61; commandant navy-yard, Philadelphia, 1862–64; commanding East Gulf Blockading Squadron, 1864–65; member of Retiring Board of 1855; in 1861, member of a Board of Commissioners (3 Senators, 3 members of the House of Representatives, 1 army, and 1 navy officer), provided for by act of Congress of July 31, 1861, to examine and report as to compensation of all officers of the government, and for other purposes; member of Light-House Board, 1862.

Commissioned as commodore, July 16, 1862.

Commissioned as rear-admiral, July 25, 1866; member of the Light-House Board, 1867–70. Total sea-service, 26 years, 2 months; shore and other duty, 19 years, 1 month. Died, 1880.

Strike. To touch bottom, as a ship strikes on a bar. To haul down the colors, in token of submission. To lower to the deck a topmast, yard, or other upper spar. To send anything below decks.

Stringer. A shelf-piece. In iron ship-building, certain plates riveted fore-and-aft, to strengthen the structure. *Hold-stringers* are plates riveted to the frames in the hold, and connected by

angle-irons to the bottom plating. *Deck-stringers* are strakes of deck-plating riveted on top of the beams next to the side, and joined by angle-irons to the outside plating. Stringers are required by Lloyd's rules in all iron ships.

Strings. The highest strakes in the ceiling of the ship.

Strip. *To strip a mast*, to remove all its rigging. *To strip to a girt-line*, to remove all the rigging from a ship. A whip or girt-line remains at the mast-head for convenience in going aloft when the ship is subsequently rigged. The expression is also used, figuratively, to signify the removing from the person of every article of wearing apparel.

Stroke. In the steam-engine, the distance passed over by a piston in moving from one end of the cylinder to the other. The sweep of an oar. A *gig-stroke* is that given in a gig or long-oared single-banked boat. A *cutter-stroke*, that in a short double-banked boat. A *long-stroke*, one of great sweep. A *short-stroke*, one of little extent, and quicker. A *galley-stroke* is that formerly used in the galleys, and still seen in Portuguese and Brazilian waters. In rowing it, the men rise to their feet as they advance the oar, and fall back as they finish the stroke.

STROKE-OAR. The aftermost oar, giving the time to the others.

STROKE-OARSMAN. The man who rows the after oar if single-banked, or the starboard after oar if double-banked. Both men on the after thwart in a double-banked boat are called stroke-oarsmen, but the starboard-man gives the stroke.

STROKE-SIDE. The side of a single-banked boat in which the stroke-oar is placed.

Strong, James H., Rear-Admiral U.S.N. Born in New York. Appointed from New York, February 2, 1829; attached to sloop "Lexington," Brazil Squadron, 1832–33; schooner "Enterprise," Brazil Squadron, 1834; Naval School, New York, 1835; frigate "Constellation," West India Squadron, 1836.

Promoted to passed midshipman, June 4, 1836; razee "Independence," Brazil Squadron, 1839–42.

Commissioned as lieutenant, September, 1841; frigate "Columbus," East India Squadron, 1844–46; receiving-ship, New York, 1851–52; sloop "Levant," Mediterranean Squadron, 1853–55; receiving-ship, New York, 1856; rendezvous, New York, 1857–58; commanding store-ship "Relief," 1859.

Commissioned as commander, April 24, 1861; commanding steamer "Mohawk," South Atlantic Squadron, 1861; commanding steamer "Flag," South Atlantic Squadron, 1862; commanding steam-sloop "Monongahela," Western Gulf Blockading Squadron, 1863–65.

In November, 1863, Commander Strong convoyed a division of the army under Gen. Banks from New Orleans to Brazos Island, at Brazos de Santiago. On November 25, 1863, a body of troops under Major-Gen. Banks captured a battery of 3 heavy guns at Arkansas Pass. Commander Strong, after assisting in the landing of the troops, steamed ahead and opened an effective fire on the battery, which soon hoisted a white flag and was taken possession of by the troops, who had also engaged it. Gen. Banks commended the effective gunnery of the "Monongahela." Commander Strong commanded the "Monongahela" at the battle of Mobile Bay, August 5, 1864. His vessel was the first to engage the rebel ram "Tennessee." He sheered out of the line to run into her, and struck her fair, at the same time giving her a broadside of solid 11-inch shot, which had, apparently, little if any effect upon her. Soon after signal was made to his ship to again run into her; he did so, and was about to try it a third time, when she surrendered to the fleet.

Commissioned as captain, August 5, 1865; inspector at navy-yard, New York, 1866–67; commanding steam-sloop "Canandaigua," European Squadron, 1868–69; attached to navy-yard, New York, 1870.

Commissioned as commodore, March 2, 1870; light-house inspector, 1871–72.

Commissioned as rear-admiral, September, 1873; commanding South Atlantic Station, 1873–75. Retired April 25, 1876.

Strong. *A strong breeze*, a breeze blowing some 20 to 25 miles per hour (No. 6 in the Beaufort scale), in which, close-hauled, only single- or double-reefed topsails, jib, courses, and spanker would be carried. *Strong gale*, a gale reducing a ship to close-reefed topsails and reefed courses,—No. 9 of Beaufort scale, blowing 35 miles per hour.

Strong-back. A samson-post. A lever over the windlass to lift the chain off of it. A light spar lashed to boat-davits, to which the boat is secured at sea.

Strop. See STRAP.

STROP-BOUND BLOCK (*Eng.*). A clew-line block, with a shoulder on it, and bound with a rope strap.

Struse. A long, unwieldy craft, used on inland waters in Russia.

Strut. A stanchion to the lower-deck beams. A stanchion of the hold. A diagonal shore.

Stubb (*Eng.*). The lower end of a rainbow, foretelling squally weather.

Stub-end. The enlarged end of a connecting-rod, containing the blocks that encircle the pin.

Stud. A piece of cast iron put across the links of large chain-cables to strengthen them.

STUD-LINKS. Links of chain that have studs in them.

Studding-sail. A sail set outside the square-sails in good weather, and when the wind is fair. The word is generally supposed to have been originally *steering-sail*, but a better derivation would seem to be from its former name of *scudding-sail*. These sails are made of light canvas, and roped with light rope. There are on each side, a lower studding-sail, a fore-topmast studding-sail, fore- and main-topgallant studding-sails, and sometimes a main-topmast studding-sail. Royal studding sails were formerly used. The use of studding-sails on board steamers is becoming obsolete. The topmast studding-sail is set with the wind a point free, but the others not until the wind is abaft the beam. They are set on both sides when the wind is exactly aft. In setting a studding-sail, it is first rolled up and then bound by thrusting a toggle in the eyes of a strap, to the end of which a laniard is made fast. When the sail is nearly up, the squilgee is pulled out, and the sail unfolds, and is then set by hauling out the tack, pulling up the halliards, and trimming down the sheet. When taken in, the stud-

ding-sails are neatly rolled up on their yards, and the lower and topmast are stowed about decks, while the topgallant studding-sail is kept in the top, extended along the rigging.

STUDDING-SAIL-BOOM. A spar rigged out for the purpose of setting a studding-sail, and taking its name from the sail above it. The lower studding-sail-boom swings out from the side of the ship. The topmast and topgallant studding-sail-booms lie along the lower and topsail-yards when not in use. When the sail is to be set, they are thrust out beyond the yard-arms. Boom-irons confine them to the yard, in-and-out jiggers handle them, and they are supported by guys when necessary. On the outer end is a jewel-block or a fixed block confined by a pin, through which the tack is rove.

STUDDING-SAIL-BOOM BRACE. A rope leading from the end of the topmast studding-sail-boom to the side of the ship abaft, serving as a brace to support the boom.

STUDDING-SAIL-HALLIARDS. Ropes used to hoist the studding-sails. They lead through blocks at the yard-arms, and are bent to the yards of the studding-sails. The *outer halliards* of the lower studding-sail lead through a block on the topmast studding-sail-boom, and a light whip is used to haul up the upper inner corner of the sail, and is then called the *inner halliards.*

STUDDING-SAIL-HALLIARD BEND. A bend used to fasten the studding-sail-halliards to the yard.

STUDDING-SAIL-OUTHAUL. The tack of the lower studding-sail, leading through a block near the end of the swinging-boom, and through a sheave in the ship's side near the gangway.

STUDDING-SAIL-SHEET. A rope fastened to the inner lower corner of a studding-sail, to assist in retaining it in place. The topmast studding-sail has two sheets, one, the *deck-sheet*, being kept on deck, and used in setting and taking in the sail. The other is called the *short sheet*. See SHORT SHEET.

STUDDING-SAIL-TACK. A rope fastened to the outer lower corner of a studding-sail, and reeving through a block on the end of the boom, so as to haul the sail out in place.

STUDDING-SAIL-YARD. The small spar to which a studding-sail is bent. They are flying yards, and are set and taken in with the sail.

Stuff. Square timber of any thickness. A mixture of tallow, turpentine, etc., applied to the masts, yards, or bottom of the ship in former times. Turpentine and resin was used on the lower masts; tallow on the topmasts; for the side, turpentine, oil, and varnish; for the bottom, tallow, sulphur, and resin.

Stuffing-box. A contrivance by which soft packing material, such as hemp, is confined in an annular space about a rod, spindle, valve-stem, etc., entering a cylinder, pump, or other vessel required to be air-tight. The packing is confined by means of a gland and screws.

Stump. *Stump masts*, masts which have been broken off. *Stump topgallant-masts*, short masts without poles.

Stun'sail. A corruption of *studding-sail*, in common use among seamen.

Sturgeon. A large cartilaginous fish of the genus *Acipenser*. The American species is the *A. oxyrhyncus*. From its roe caviare is made, and isinglass from its muscular parts.

Subbrachian. One of an order of malacopterygious fishes, comprising those which have the ventral fins situated either immediately beneath or between, or a little in front of or behind, the pectoral fins.

Sub-calibre. A term applied to projectiles that are smaller than the bore of a gun, and that are enlarged by expanding bands, sabots, etc.

Sub-lieutenant. The rank next below lieutenant in the English navy.

Submarine Bank. A bank with deep water over it.

Submarine Boat. A boat for use below the surface of the water.

Submarine Explorer. A double diving-bell, furnished with air- and light-chambers, and appliances for purifying the air contained within.

Submarine Gun. A gun intended to project a shot below the surface of the water. Submarine weapons are said to have been devised by Calluricus for use with Greek fire, but doubt exists of this. In 1797, Saint Cyr proposed a catamaran with a submarine gun. Fulton, in 1814, experimented with such guns in New York harbor. Mr. Phillips, of Indiana, in 1855, and Mr. Woodbury, of Boston, in 1861, made experiments with these guns, firing them under water, and the latter gentleman has made other plans since that time for using these guns. "Jones's submarine battery" shattered a raft passing over it in New York harbor in 1862. A submarine gun was shown in the Paris Exposition in 1867, designed by a Mr. Duffy. Experiments made in England in 1864 demonstrated that guns could be successfully fired under water, and that the projectile acquired considerable velocity, and deviated considerably. Ericsson in experimenting with submarine guns, for use in his torpedo-boat, at first used steam, but later, had recourse to explosives. His experiments are not concluded. The necessity of a weapon that will attack the ship below the water has given, since the advent of armored vessels, considerable impulse to the subject of submarine guns, but at present they are not so greatly developed as submarine mines or torpedoes.

Submarine Lamp. A lamp for use under water. Many such have been devised, but they will now be replaced by the electric light.

Submarine Mines. The term "submarine mines" is applied to defensive mines, or those which would be used to obstruct the channel of a river, or the approaches to a fortified seaport. Col. Samuel Colt, the inventor of the revolver, first demonstrated the practicability of blowing up vessels by submarine mines fired by electricity. After many years devoted to experiments, about the year 1842 he blew up the old gunboat "Boxer" with a submarine mine, exploded by means of a galvanic battery. After destroying several hulks at anchor, on the 13th of April, 1843, on the Potomac River, he blew up a brig while under way, sailing at the rate of 5 knots an hour. He had stationed himself at Alexandria, 5 miles distant from the mine. Nothing further was done at the time, although Col. Colt, in a letter to the President of the United States, clearly explained the great value of this invention for defending our harbors from an enemy.

The Russians used submarine mines to defend their ports during the Crimean war, but no vessels were destroyed by them.

The South, during the late civil war, first proved the great value of submarine mines for river and harbor defense. The torpedo and submarine mine were never before fully recognized as legitimate engines of war.

The first mines encountered by the Federal navy were planted in the Savannah River, about February, 1862, but for some time they were so crude in construction as to cause little damage. However, during the summer of 1863 they became very effective. One of the most successful of the many kinds employed by them was the Singer torpedo, as it was then called. This consisted of a tin case holding from 50 to 100 pounds of powder arranged so that it was buoyant, and anchored in the channel at the proper depth. It had on its top a heavy cast-iron cap, which, when the torpedo was struck by a passing vessel, fell off, thus pulling a string fastened to a small pin. The pulling out of this pin caused the explosion of the mine. Obstructions in channels and on bars were frequently made much more formidable by submarine mines fitted with fuzes to explode by contact when struck by a vessel's bottom. Regular frames were sometimes constructed to support the mines. These were called "frame torpedoes." The Federal gunboats never tried to force a passage through a channel defended in this manner.

A great number of buoyant mines were used by the rebels, particularly in the beginning of their use of submarine mines. These consisted of barrels or other vessels partially filled with powder, and anchored in channels and harbors; they were fitted with sensitive or contact fuzes, and were much dreaded by our navy.

Towards the end of the war, during the summer of 1864, the rebels planted enormous mines at Charleston, Mobile, Fort Fisher, and in the James River. At first old boilers were used as cases, but soon regular ones were made. These mines were fired by electricity, and proved very effective. During the war 7 monitors and 11 wooden vessels of war were totally destroyed by submarine mines, and all these occurred during the last half of the conflict. Had the rebels possessed the same knowledge of submarine mines and torpedoes at the beginning of the war that they possessed at its end, the struggle would at least have been much prolonged. While submarine mines arranged to explode on contact with a vessel may be useful to a blockading force and other special occasions, the certainty of explosion by electricity makes that the desirable method, when they are intended to assist in the defense of a river or harbor. Besides, when fitted with electrical fuzes they allow friendly vessels to pass over them in safety.

The difficulty originally in using electricity to explode the mines was in determining the exact relative position of the vessel and mine, so as to produce an effective explosion. But by planting the mines in groups, and by careful ranges, together with the use of plane tables and other instruments suitable for the purpose, the position of the vessel can be accurately determined. The firing of the mine the instant the vessel is proven to be over it by two distinct ranges is now done by a self-acting instrument, invented for this purpose. The use of gun-cotton has added to the efficiency of this method of defense, as that explosive is not injuriously affected by dampness. Formerly the great number of insulated wires required—two, and afterwards one to each mine—was a serious trouble in putting down submarine mines, but a recent invention of Capt. McEvoy's, called "McEvoy's single main system," does away with the necessity of more than one wire from the battery on shore to the group of mines. Each mine is connected by a wire of its own to the "junction," and a single wire connects this instrument to a similar one on shore. By means of this invention each mine is under as thorough control as though it had a wire of its own.

The importance of submarine mines for the defense of our harbors and coast cannot be overestimated, yet they should be, in order to be thoroughly efficient, supported by heavy rifled guns, so that the enemy's vessels would be unable to drag for them or destroy them by any means. The manufacture and planting of submarine mines for harbor defense in this country is one of the duties confided to the army. They are exploded from the forts nearest at hand. This is chiefly a matter of nice calculation. Whereas the manufacture and use of torpedoes belongs to the navy. In their successful employment is required the highest order of personal courage, coolness, and determination under the most trying circumstances.—*R. M. G. Brown, Lieutenant U.S.N.*

Submarine Navigation. Navigation of the depths of the ocean by means of submarine boats.

Submarine Projectiles. Projectiles for use below the surface of the water. Shot, shell, and rockets are used, and differ little, if any, from those used above the surface.

Submarine Rocket. A rocket for use under water. Such rockets were used as early as 1730 in France. In 1823, Joshua Blair devised them in America, but they were not put in use. Montgery, in France, proposed a battery of rockets in 1825, firing them from a gun under the surface, using a lap-valve in the ship's side. Major Hunt tried rockets from a 12-inch gun in a caisson in 1862. He was drowned, and experiments ceased. Mr. Quich, in England, in 1872, Mr. Weir, of New York, in 1874, Gunner Burdett, of the U. S. navy, in 1874, and Van Schelila, in Russia, in 1874, have all proposed and planned rockets more or less successful.

Submarine Telegraph. A telegraph wire-cable armed to prevent the action of water, grinding on rocks, etc., crossing the shallower sea-depths. The first was laid in 1858, across the ocean. See TELEGRAPH CABLES.

Submarine Telescope. A telescope used for looking at objects below the surface. It consists of two tubes united, one of which is thrust into the water, the other throwing light into it.

Submarine Thermometer. A thermometer for use in sea-depths, specially constructed to sustain the great pressure of the water. See DEEP-SEA SOUNDING.

Submarine Valve. A valve used in connection with a submarine gun, opening in the side of the ship, and allowing the gun to emerge.

Subsidy. A sum paid to the owners of steamer-lines, to aid them in establishing the line. Subsidized steamers are generally available for war purposes, and some have been built with a view to their use as cruisers.

Subsistence. The amount of rations, clothing, etc., furnished to men.

Suck. To draw air when the water is low, said of a pump. *To suck the monkey* (*Eng.*), to rob the grog-can.

Sucker. The lump-fish. The sucking-fish, or *remora*.

Sucking-fish, or Suck-stone. This fish has a long oval plate on the top of the head, by which, having exhausted the air in it, it clings to a ship's bottom, to the sides of a shark, or to turtle. Among the ancients the remora was credited with power to impede and even arrest the progress of vessels,—the delay of Antony's ship in getting into the battle of Actium being attributed to it. A curious use of the remora, said to prevail on the coasts of Mozambique, is as an auxiliary to the fishermen, who, fixing a ring, with a cord attached, around its tail, place it in a vessel of sea-water and carry it in their boat till they discover a sleeping turtle, when, having approached as near as practicable, they throw the remora in the direction of the turtle, to which it seldom fails to attach itself, when drawing in the cord the fishermen secure their prize.

Suction. A term applied to the tendency of matter, under atmospheric pressure, to fill a vacuum.

Suction-pipe. A pipe through which a fluid is supplied to a pump, either by its weight or the atmospheric pressure.

Suction-valve. The receiving-valve of a pump, or one which prevents the reflux of a fluid through the suction-pipe.

Suez. A frontier seaport town of Egypt, near the head of the Gulf of Suez. It is connected by railway with Cairo and Alexandria, and since the construction of the Suez Canal, which crosses the Isthmus of Suez from Port Said to this town, it has greatly improved. It has always been a place of extensive transit trade. Two miles south of the town is a spacious new artificial port, with a dry-dock, besides which there is a canal-port, with extensive buildings, and a quay. Lat. 29° 58′ 6″ N.; lon. 32° 34′ 2″ E. Pop. 13.000.

Suffren de Saint-Tropez (Pierre André de), commonly known as the Bailli de Suffren, and one of the most illustrious of French seamen, was born at Saint Cannat, near Lambesc, in 1726, and died in Paris in 1788.

Suffren's whole life may be said to have been passed in fighting the English. As was, and is, still customary among noble families, that of Suffren (to increase the fortune of an elder brother) devoted the younger to the Order of Malta and to a sea-life. Fortunately the young aspirant was eminently fitted for, and loved his destined profession. He not only possessed the most dauntless courage, but had acquired a great deal of general knowledge, and was early distinguished for elevation of character and coolness of judgment. In spite of his fitness for the naval service he made his way in it rather slowly, considering his family, and the spirit of the times.

Entering the navy in 1743, he was, after several very active cruises, made ensign in 1748; and with that rank took part in the operations at Belle Isle, where he was made prisoner by the English. The treaty of Aix-la-Chapelle restored him to liberty, and he then went to Malta, where he took active service for a considerable period. In 1754 he re-entered the French Royal Marine, and was employed in the squadron of La Galissonnière at the siege of Mahon, in 1756. Was again made prisoner in 1759, and after various vicissitudes and constant service, finally attained the grade of *capitaine de frégate* in 1767. After attaining this rank in the French navy, he made several cruises in the galleys of his order, and became a Commander of Malta.

The title of *Bailli*, by which he is best known, was not given to him until some years after this time.

Becoming *capitaine de vaisseau* in 1772, he served with great credit in the Levant, and afterwards in the French fleet which served on the American station during our Revolution.

When it became plain that most active measures were necessary to prevent the seizure of the French and Dutch East Indian colonies by the English, Suffren was the officer selected to protect French interests, and to uphold the honor of his flag in those distant seas.

Sailing from Brest, as *chef d'escadron*, or commodore, of a squadron composed of 5 line-of-battle ships and 2 frigates, he carried out a body of troops destined for the Cape of Good Hope. On the passage, in the latitude of the Cape Verde Islands, April 16, 1781, he encountered an English squadron, with which he had a successful fight, and proceeded to the Cape of Good Hope, which colony he reinforced and reprovisioned.

From the cape he sailed for the Isle of France, where he united his squadron with that of the Count d'Orvès.

The death of that officer soon left him in command of the fleet, and in February, 1782, he inflicted a crushing defeat upon the English fleet under Admiral Hughes, near Madras, after which he concluded an alliance with the celebrated Hyder Ali, who was then striving against the English with great desperation.

Suffren again defeated an English fleet off Negapatam, formerly the capital of the Dutch possessions in India, and captured Trincomalee. The English, indeed, never had so capable and worthy an opponent in that part of the world, and were no doubt relieved when the peace of Versailles, in 1783, caused the French seaman to return home, where he was received enthusiastically and loaded with honors.

New complications with England having arisen in 1787, Louis XVI. gave Suffren the command of a fleet fitting out at Brest; but he died suddenly, at Paris, just as his orders were made out.

It was given out at the time that he died of apoplexy; but, according to Jal, the historiographer of the marine, he was killed in a duel. The story was that the Bailli de Suffren had punished two young aspirants, serving under his orders, for some military breach; and when their relative—a grand signeur—came to the Bailli to plead for them, the latter used no measured language in regard to them and their offense.

A duel ensued at once, the Chevalier Bemin being the witness. Suffren was greatly at a disadvantage, as he was so fat as to be unwieldy. His groin was pierced by his antagonist's sword, and he died almost instantly.

The Bailli is described as being not above the ordinary height, but immensely fat. He had very regular features, and a very noble and

pleasant expression. His manners are said to have been polished and easy, while to his inferiors he was particularly kind and considerate.

His men, knowing his courage, coolness, and judgment in action, were willing to follow him anywhere, and Suffren was as quick to notice and reward courage and conduct as he was sure to detect and punish the least ill-conduct or cowardice.—*E. Shippen.*

Sugar-loaf. A hill shaped like a sugar-loaf. Applied to the waves, a sugar-loaf sea is one in which the waves rise into sugar-loaf shapes, with little wind.

Sugg (*Eng.*). To move or roll heavily on a bank or reef.

Suit. *Suit of sails*, a set of sails.

Sullage. The deposit of mud and silt by water.

Sullit. A broad and deep Dutch fishing-boat.

Summary Court-martial. See COURT-MARTIAL.

Summer-blink. A transient sunny spell in bad weather.

Sumner's Method. See NAVIGATION.

Sump. A swamp or bog.

Sun. The direction of the sun in the northern hemisphere is to the right of an observer looking to the north, hence motion to the right, or from left to right, is *with the sun.* Motion in the opposite direction is *against the sun.*

SUN-DOG. A portion of a luminous circle about the sun.

SUN-FISH. A soft-finned fish of the genus *Orthagoriscus* (*O. mola*), having a short disk-like body and two fins. The *Selachus maximus*, or *basking shark.*

SUNRISE AND SUNSET. It is important to the navigator to know the times of sunrise and sunset. A gun is fired at sunset in every harbor where there is a man-of-war, colors are hauled down, etc. The time of sunset is given in nautical tables, and is tabulated for all latitudes and declinations. It is usual to hoist boats, and sometimes light yards are sent down at sunset.

SUN-STAR. A star-fish; the *Solaster papposa.*

Sunderland. A borough and seaport town of England, at the mouth of the Wear, in the North Sea. The town proper occupies a peninsula between the expansion of the Wear and the sea. This is one of the principal ports of England for the shipment of coal; it has besides a large export of lime, glass, earthenwares, rope, and chemical products. Mercantile ship-building is extensively carried on. The harbor is defended by batteries, and connected with it are large docks. Lat. 54° 54′ N. Population of the borough 99,000.

Sunken Rock. One lying beneath the surface.

Sunken Vessels, Raising. Sunken vessels are now raised by various methods. One, very successful, consists in sending down and attaching to the hull a number of casks, containing compressed air in chambers, liberated after the casks are attached. Small vessels are raised by chains and powerful steam appliances for heaving in on them.

Sunn-hemp. Also called brown-hemp, or Madras hemp, a kind of hemp made from the fibres of a kind of Indian plant; the *Crotolaria juncea.*

Superannuated (*Eng.*). Retired from service on account of age.

Supercargo. A person in the merchant service charged with the sale of the cargo, and other commercial transactions.

Superheat. To heat, as steam, after separation from the water, thereby increasing the elastic properties.

SUPERHEATER. A part of or attachment to the boiler, in which the steam is superheated.

Superior. See CONJUNCTION, PLANETS.

Superior Officer. An officer whose rank is higher in comparison with another. A senior officer.

Supernumeraries. Men above the regular complement, borne on a separate list. Extra members of a ship's, boat's, or gun's crew.

Supporter. A curved knee, placed under the cat-head. A pin at the hounds of the mast, to support the trestle-trees in small vessels.

Sura. Another name for *toddy.*

Sures. Southerly winds on the west coast of South America. When rain or fog comes with them, they are *sures pardos.*

Surf. The swell of the sea breaking upon the shore or on rocks, etc. Properly speaking, surf is only those swells breaking in gradually shallowing water on approaching a shore, each of which is a roller; while the sudden breaking up of waves on rocks or other obstacles are *breakers.* In rowing to seaward the danger is that a heavy sea will up-end the boat, or turn it broadside on. If sufficient command can be kept over the boat, the sea is avoided, if possible, so as not to meet it at the moment of its breaking. If impossible to avoid the sea, give the boat sufficient speed to prevent her being carried back by the wave.

In rowing before a heavy surf, the effect of a sea is to throw up the boat's stern and to depress her bow. If she then have sufficient inertia she will assume in succession the descending, the horizontal, and the ascending positions, as the wave passes under her stern, her midships, and her bow. If a boat with little inertia be overtaken by a heavy roller, her stern is raised, and the boat is carried along bodily on the front of the wave, the bow meanwhile immersed in the hollow of the sea, where the water is comparatively stationary and offers a resistance. The danger now is that the boat will be turned end-over-end, or that she will broach to. To lessen the danger attendant upon rowing in before the surf, the following instructions have been laid down:

1. As far as possible avoid each sea by placing the boat so that the sea will break ahead or astern of her.

2. If the sea be very heavy, or if the boat be very small, and especially if she have a square stern, bring her bow around to seaward, and back her in, rowing ahead against each surf that cannot be sufficiently avoided to allow it to pass the boat.

3. If it be considered safe to proceed to the shore bow foremost, back the oars against each sea on its approach, and if there is a drogue, or anything in the boat that may be used as one, tow it astern to aid in keeping the boat end-on to the sea.

4. Bring the principal weights in the boat toward the end that is to seaward, but not to the extreme end.

5. If a boat worked by sails and oars be running under sail for land through a heavy sea, her crew should, unless the beach be quite steep,

take down her masts and sails before entering broken water, and take her to land under oars alone. If she have sails only, her sails should be much reduced, a half-lowered foresail, or other small head-sail being sufficient. A boat should be steered with an oar over the stern.

Landing in a Surf.—On a flat shore the boat is kept end-on to the sea until she is fairly aground, and she is then taken farther in by each sea, aided by the crew, who jump out to lighten her, and drag her in. On a steep beach it is the general practice, in a boat of any size, to retain speed right on to the beach, and in the act of landing to turn her bows half round, so that she may be thrown on her broadside upon the beach. When the surf breaks only a short distance from the beach, a boat may be anchored outside the surf, and veered or backed in from her own anchor.

SURF-BOAT. A boat used to land passengers and freight in a surf. Boats of various forms are used, and the natives of many of the Pacific islands have some very good boats for this purpose.

SURF-DUCK. The *Anas perspicallata.*

Surface-condenser. A condenser in which steam is condensed by contact with cold metallic surfaces. See CONDENSER, MARINE STEAM-ENGINE.

Surface-current. The deep-sea currents of the surface. (See CURRENTS.) Fresh water running over salt at the mouths of rivers.

Surface, Water-heating. The surface in a steam-boiler from which the heat of the fire is absorbed by the water.

Surge. A large swelling wave. The tapered part of the whelps on a capstan. The slacking-up of a cable on the capstan. The swaying motion of a ship that is aground as she rises to the seas. To swell, as the waves. To slacken up a rope suddenly. To rise and fall with the heave of the sea when on a reef. *To surge the capstan*, to slacken the rope about it. *Surge ho!* a warning given when a rope is to be surged.

Surgeons. The name of surgeon does not appear in any of the accounts of the British navy before the year 1557, although probably of much earlier date in that establishment. During the civil wars of Charles I.'s time it was not uncommon for doctors of medicine to act as captains and command regiments of cavalry and infantry.

The title is a contraction of the French *chirurgien*, Latin, *chirurgus*, both derived from a Greek word signifying operating with the hand. In Spanish the word is *cirujano*, Portuguese *cirurgiao*, Italian *chirurgo*.

The medical corps of the royal navy is composed of a director-general, inspector-generals of hospitals and fleets, deputy inspector-generals, staff-surgeons, first and second class, and surgeons.

Old Sir William Monson says, "The surgeon is to be placed in the hold, where he should be in no danger of shot; for there cannot be a greater disheartening of the company than in his miscarrying, whereby they will be deprived of all help for hurt and wounded men." See MEDICAL CORPS.

SURGEON'S DIVISION. The apothecary, nurse, and others attached to the medical department on board ship.

SURGEON'S MATE. A former rank in the English navy, now *assistant surgeon.*

Survey. An inspection or examination into stores, etc. To ascertain the form, dimensions, position, etc., of a portion of the surface of the earth.

SURVEY, BOARD OF. A board of three or more officers, appointed to survey government property to ascertain its condition and disposition. Surveys are ordered by any commanding officer on representation of the necessity therefor, or on all stores purchased or made for the service. Boards may summon experts to assist them. They must ascertain the cause, nature, and extent of the damages, and recommend the disposal of condemned property. All purchased articles must be passed by a board before they are paid for. A *medical survey* is ordered on any persons so disabled as to make it desirable or necessary.

SURVEYING. The art of determining the area, etc., of any part of the earth's surface, and delineating it on paper. See CHART, HYDROGRAPHY.

SURVEYING-VESSEL. A vessel fitted for making a maritime survey.

SURVEYORS. Examiners employed by underwriters. Two officers, formerly on the English Naval Board, charged with the building and repairing of ships in the navy.

Suspend. To debar an officer from the execution of the duties of his office. Unless the officer is to be brought before a court-martial, his suspension cannot exceed 10 days.

Svalocin. The star *a Delphini.*

Swab. A long mop, made by binding rope-yarns in a bundle, used to dry the decks, etc. *Hand-swab*, a small swab made from the threads of canvas. The term *swab* is applied to an epaulet, and also, in an uncomplimentary way, to a sailor.

SWAB-ROPE. A rope bent to a swab, for dipping it overboard.

SWAB-WASHER. The captain of the head.

SWABBER (*Eng.*). Formerly, a petty officer on board a man-of-war, whose duty was to see the decks clean. (*Eng.*) A man formerly appointed to use the swabs in drying decks; called also ship's sweeper, or captain of swabbers.

Swad. A fish-basket.

Swag. To sink down; to sag down.

Swage. A tool used by shipwrights in driving in eye-bolts, etc.; it is made to fit the head of the bolt, so that in driving or striking on the swage, the bolt is forced in without bruising the head of it. It is also used by shipsmiths in making the various kinds of bolts.

Swallow. The aperture in a block through which the rope reeves.

Swallow-fish. The *Trigla hirundo*, a fish with large gill-fins; also called *Sapphirine gurnard.*

Swallow-tail. The points of a *burgee*, or swallow-tailed flag.

Swamp. To capsize or fill a boat with water.

Swape. A wooden support for a light. A pump-handle. A long oar used in English *coal-keels.*

Swart-back. The great black and white gull; the *Larus marinus.*

Swash. A sudden surge of the sea. A shoal in a tideway, over which the tide ripples. A narrow sound inside of a shoal.

SWASHWAY. A channel across a bank or among shoals.

Swathe (*Eng.*). The entire length of a wave.

Sway. To hoist; to raise. *To sway on end*, to hoist to a perpendicular position from the deck. *To sway across*, to sway a yard to a horizontal position. *To sway away on all top-ropes*, figuratively, to go to great lengths.

Sweat-box. A narrow cell in which prisoners were formerly confined.

Sweating the Purser (*Eng.*). Wasting the stores, burning candles up, etc.

Sweden and Norway, Navy of. Although Gustavus Adolphus set little store by a naval power, the exigencies of later wars than that in which he took so conspicuous a part have obliged the combined states (now under one monarchy) to possess considerable fleets. Washed on one side by the Baltic and on the other by the North Seas, Norway and Sweden have always produced hardy seamen and skillful navigators, and whenever engaged with an enemy they have given a good account of their potency. At the present time the navy of Sweden is divided into two branches,—the navy proper and the "coast artillery." The navy consists of 38 vessels, all unarmored, and mounting 325 guns. The largest ship, the "Stockholm," is of 2850 tons displacement, carrying six 7-inch and sixty 30-pounder guns, and has a speed under steam of 6½ knots per hour. The next in rank is the "Vanades," of 2130 tons, armed with 16 guns, and having a maximum speed of 11 knots. There are also 18 unarmored gunboats, 4 corvettes, and 12 sailing-vessels. The coast artillery is the most important arm of defense, its total force being 120 vessels of all kinds. The most important are the 4 monitors, "Loke," "John Ericsson," "Thordoen," and "Tyrfing." The largest of these, the "Loke," is of 1600 tons displacement, 450 horse-power, and has a thickness of armor of 5 inches at the water-line; her armament consists of two 10-inch guns mounted in a single fixed turret. The others are of nearly the same size and power. There are also 10 armored gunboats with fixed turrets, 44 sloop-rigged galleys, 6 mortar-launches, and 53 yawls. The headquarters of the navy is at Stockholm, the island of Skeppskolm being occupied as the repairing and outfitting yard, and there is also a naval establishment at Carlscrona.

The small fleet of the Norwegian navy is composed of 4 monitors, 1 frigate, 4 corvettes, 1 sloop, and 22 gunboats; also 4 sailing-vessels, and 2 torpedo-boats. The monitors are the only armored vessels in the navy. There are, in addition to the above, 83 small boats of different kinds, carrying from 1 to 6 guns each. One of the monitors, the "Thor," is of 600 horse-power and 2003 tons displacement; another, the "Thrudnang," has 500 horse-power and 1575 tons; the third, the "Mjalner," 1515 tons and 450 horse-power; and the fourth, the "Skarpianen," 1447 tons and 350 horse-power; and the armament of each consists of two 9-inch Armstrong guns mounted in a single revolving turret. The "Thor" has 7 inches of armor, the others 5 inches. The frigate, the "Kang Suerre," is of 1500 horse-power, 3472 tons displacement, and mounts 50 guns. Of the corvettes, the "St. Olaf" is of 1100 horse-power, 2182 tons displacement, and carries 38 guns; the "Nordstjernen," 1609 tons, 720 horse-power, and 19 guns; the "Nidaros" and "Nornen" are of 1700 and 1550 tons displacement respectively. The fleet will soon be strengthened by the addition of 3 gunboats building at Stockholm. The navies of these two countries are distinct services, each having its own complete organization and administration. The Norwegian navy is represented in the cabinet by a rear-admiral, chief of the marine department, who is assisted by a second rear-admiral, chief of staff. The central control at Stockholm is divided into three main sections, with controllers at their heads, and subdivided into bureaus. The general administration is divided in control between two dockyards, Christiania and Stockholm. There is also a naval academy, hydrographic office, and observatory. The Swedish navy is represented in the cabinet by a minister of marine, the central control having two main divisions, chancellery and command. There is in addition a commander-in-chief of *personnel*, a military department, construction department, commissariat department, pilotage department, naval school, and hydrographic office. The general administration is divided between the two naval stations of Carlskrona and Stockholm. The *personnel* of both navies is recruited by voluntary enlistment, there being a special arrangement for conscription in case of war in the maritime districts of all persons between the ages of 22 and 35 years. The annual expense of the Norwegian navy is about $600,000, and of the Swedish navy about $1,500,000. The *personnel* consists of 108 commissioned officers and 150 non-commissioned and 2080 enlisted men in the navy of Norway, and the royal fleet of Sweden is manned by 5607 men, distributed as follows: vice-admiral, 1; rear-admirals, 3; commanders, 5; captain-commanders, 20; captains, 43; lieutenants, 43; sub-lieutenants, 26; engineers, 13; medical officers, 24; petty officers of first class, 401; petty officers of the second class, 844; mechanicians and workmen, 150; seamen, 2385; seamen employed on shore, 1310; recruits, 339. Total, 5607. There are no foreign squadrons in either navy, the Norwegian ships are entirely confined to coast defense, and in the Swedish fleet the cruising is confined to single vessels. There is a royal naval reserve besides the force actually in commission, and a Beööring which numbers 40,000 men. All sea-faring men and dwellers in seaports are amenable to the maritime conscription.

Sweep. The trend of a coast to a crescent. A large, broad oar used in racing-boats, and formerly to propel small craft in a calm. The curve of the leech of a sail. To drag with the bight of a rope for an object at the bottom of a harbor. To scan the heavens rapidly, and in a systematic manner, in search of a star. *To sweep down*, to clean the decks with a broom. *Sweep of the tiller*, the arc on which the end of the tiller traverses.

In the year 1800, and for some time afterward, it was customary in forming ship's bodies to design portions of the frames by the use of arcs of circles called sweeps, of which there were generally five:

1st. The *floor-sweep*, which is limited by a line in the body-plan perpendicular to the plane of elevation, a little above the keel, and the height of this line above the keel is called the dead-rising. The upper part of this arch formed the head of the floor-timber. If a straight line be

drawn from the upper edge of the keel to touch the back of the floor-sweep, the form of the midship-frame below the lower height of breadth will be obtained.

2d. The *lower breadth-sweep*, the centre of which was a line representing the lower height of breadth.

3d. The *reconciling sweep* joins the two former without intersecting either, and makes a fair curve from the lower height of breadth to the rising line.

4th. The *upper breadth-sweep*, the centre of which is in the line representing the upper height of breadth of the timber. This sweep describes upwards from the lower part of the top timber.

5th. The *top-timber sweep*, or *back-sweep*, is that which forms the hollow of the top timber. This hollow is, however, very often formed by a mold so placed as to touch the upper breadth-sweep, and pass through the point limiting the half breadth of the top-timber. No attention is paid to these instructions nowadays in framing ship's bodies.

Sweeper. A person appointed to sweep the deck at intervals. *Sweeper of the sky*, a sailor's term for a northwest gale.

Sweep-net. A large draw-net used in fishing.

Sweep-piece. A curved piece of wood fastened to the port-sill, to aid in training a gun.

Sweetening-cock. A cock in the ship's side to admit sea-water into the hold.

Swelchie. A swirling current formed in the Hebrides. A seal.

Swell. The rise and fall of the waves during a calm. A rolling wave, the result of winds either present, preceding, or following it. The increase in diameter at the muzzle of a gun. The increased size of a mast at the hounds.

Swift, or Swifter. A small rope passed from bar to bar of the capstan. A strong rope passed about a frail boat, to strengthen her. A hawser used to swifter in rigging. The forward shroud. Formerly, in the English service, the after pair of shrouds. To *swifter a ship*, to haul her ashore, or to careen her. To encircle a ship or boat with ropes, to strengthen her. To *swifter the bars*, to pass a swifter around the ends of the capstan-bars, so as to distribute the strain. To *swifter in the rigging*, to tauten slack rigging by passing a hawser through blocks in the rigging 8 or 10 feet from the rail, and through blocks on the opposite side of the deck, and hauling it taut.

Swig. A pull on a rope fast at both ends. A tackle whose falls are not parallel. *To swig off*, to pull a rope that is fast at both ends, by swaying or throwing the weight on the bight of it.

Swill (*Eng.*). A wicker fish-basket. The air-bladder of a fish.

Swim. The air-bladder of a fish. To move in the water by means of fins, or by the hands and feet. To float, or be borne up by the water. Swimming should be taught to all sailors. Men may swim from 10 to 15 miles, and it is on record that the Hellespont has been crossed several times, where it is 20 miles wide.

Swine-fish. The wolf-fish.

Swing. To turn around by action of wind or tide when at anchor. *Swinging ship*, the operation of determining the local deviation of the compass, by bringing the ship's head successively to each point of the compass, and taking bearings of a distant object. See Compass.

Swinging-buoys. A set of buoys planted in a convenient place for swinging ship.

Swinging-boom. A long spar, used at sea to stretch the foot of a lower studding-sail, and in port for the boats to hang on to. It is secured by an iron goose-neck to the fore-channels, is supported by a topping-lift, leading through a block on the fore yard-arm, and is retained in place by forward and after guys, leading to the bowsprit and to the gangway. When not rigged out, the after end lies in an iron crane. It has ladders and pendants hanging from it, to which the boats make fast.

Swipes (*Eng.*). Weak beer issued to sailors.

Swirl. An eddy of wind, or in the water. A knot in timber.

Swish (*Eng.*). The light, driving sea-spray.

Swivel. A link, ring, or pin moving about in a socket. *Swivel-bolt*, a bolt turning about its axis. *Swivel-block*, a block turning on a swivel. *Swivel-gun*, a small gun fixed on a pivot, or swivel. *Swivel-hook*, a hook fixed so as to turn on a swivel. *Swivel rowlock*, a rowlock turning on a swivel. *Swivel-link*, a link in chain fitted to turn about a swivel, so as to keep it free from turns. They are placed in each length of 15 fathoms of a cable. *Swivel-eyed*, cross-eyed.

Swona Wells (*Eng.*). Whirlpools near Swona Island.

Sword-fish. The *Xiphias gladius*, a fish of the *Scomberidæ*, or mackerel family, having a long, pointed, sword-shaped upper jaw.

Sword-knot. A gilded knot worn on the sword-hilt. See Uniform.

Sword-mat. A mat made of rope-yarns, by weaving them closely, used for chafing-gear.

Sydney, the capital of the British colony of New South Wales, in Australia, is situated on the southern shores of Port Jackson, 5 miles from the entrance of the harbor. The harbor is quite landlocked, with deep water to the edge of its rocky shores. It has 2 large dry-docks, an observatory, several parks, and a museum. It has an extensive commerce, and a regular line of steam-packets ply between Sydney, Wellington (New Zealand), and Panama. Lat. 33° 51′ S.; lon. 151° 11′ 42″ E. Pop. 136,000.

Sympiesometer. An instrument for measuring the weight of the atmosphere by the compression of gas. Hydrogen gas is generally used.

Syphering. Lapping the chambered edges of planks so as to form a plane surface.

Syzygy (Gr. *suzugia*, a yoking together; from *sūn* together, *zugon*, a yoke). The position of the sun, earth, and other moving body, when their projections on the plane of the ecliptic are in one line. By the *syzygies* of a planet or of the moon are meant those points of its orbit at which the body is in conjunction or opposition with the sun; the two points when the body appears 90° from the sun being distinguished as the *quadratures*. "The moon in syzygy" expresses the position both of conjunction and opposition, the times both of new and full moon; and the term, consequently, is a very handy and appropriate one in speaking of the tides.

Syzygy Tide. The tide which takes place on the afternoon of the day the sun and moon are in syzygy: if the syzygy takes place when the sun or moon is on the meridian, the tide is particularized as the *meridional syzygy tide*.

T.

T. Abbreviation for *the* in the U. S. General Service Signal Code. In the log-book, *t* indicates *thunder*.

Taberin. A species of shark found in the neighborhood of Ceylon.

Tabernacle. An attachment to the mast of a river-boat by which it can be lowered when passing under a bridge.

Table. An arrangement of numbers expressing the data of the motions and positions of heavenly bodies, by the aid of which computations in astronomy and navigation are made.

Table-cloth. The name given to the white, fleecy clouds which sometimes hang over the "table" or flat top of Table Mountain at the Cape of Good Hope, indicating the approach of a southeast gale.

Table-money. An allowance received by the higher grades of officers in some navies with which to furnish their tables.

Table-shore. A low, flat shore.

Tabling. A broad hem on the edges of a sail to which the roping is sewed; also, a method of securing two planks by alternate projections and depressions.

Tack. The lower corner of the luff of a fore-and-aft sail. The rope by which the outer lower corner of a studding-sail is hauled out to the boom. The purchase by which the weather lower corner of a course is confined. To change the direction of a vessel from one tack to another when close-hauled, by bringing the head into the wind and causing it to fall off with the wind on the other bow, by using the helm and sails. A vessel is on the *starboard tack* when the wind blows against the starboard side, but on the *port tack* when the wind is on the port side. *Tack and half-tack*, a long and short tack. *Rise tacks and sheets!* An order given in tacking a square-rigged vessel, at which the tacks and sheets of the courses are let go and the clews hauled up. The expression *not to start tack or sheet* means that no sail is taken in. When applied to a person it implies a resolution not to move.

TACK-BLOCK. The block through which a tack reeves.

Tackles. Combinations of ropes and blocks used as a mechanical power for moving or hoisting heavy weights.

They are variously applied on shipboard for sending aloft masts and yards, hoisting, setting, or taking in sails, setting up or tightening the rigging by which the masts are supported, and in moving guns, anchors, etc.

The necessities for the application of this power are constant, and it is by its use that a limited number of persons are able to control the force of wind and sea which is exerted upon a vessel.

A block consists of the *shell* or outside framework, either of wood or iron, in which the sheaves or pulleys are secured by an iron pin passing through their centres, over which the rope or *fall* passes. The most simple form of a tackle is that in which only a single fixed block is used. In this case there is no gain in lifting power, as the power applied to the rope on one side of the block must be equal to the weight on the other side in order to sustain it. The advantage gained, however, is that the power can be more effectively applied.

If the single block be attached to the weight to be raised, one end of the rope being secured and the power applied to the other end, the lifting power is doubled, for the weight is then sustained by two parts of the rope, each of which bears an equal strain.

Let the rope be passed through another fixed block; the lifting power of the tackle remains the same, but greater convenience and effect is obtained in the application of the power, or, the men who pull upon the rope.

It is then evident that the ratio of the lifting power of a tackle to the applied power depends upon the number of parts of rope which are connected with the movable block, while stationary blocks serve only to give direction or *lead* to the rope, or a more effective application of the power.

If the standing-part of the fall is fastened to the movable block, the advantage of one more part is obtained, and in order to exert the greatest amount of power with a tackle, that block should be applied to the weight which contains the greatest number of parts of the rope.

To ascertain the power which it is necessary to apply to a tackle in order to sustain a certain weight, *divide the weight by the number of parts of rope attached to the movable block*, or $P = \frac{W}{n}$.

Thus far the weight has been considered only as sustained or balanced by the power applied to the fall. If the weight is raised by such an increase in the applied power as shall set the sheaves in motion, the important element of *friction* must be considered in calculating the amount of power which it is necessary to apply in raising a certain weight.

On account of friction, the amount of tension upon each part of the rope will differ. The *hauling-part*, having the friction of all the sheaves to overcome, will bear the greatest strain; while the *standing-part* will have only its proportional part of the weight to sustain. Each intermediate part will also sustain its own proportional part of the weight, increased by the friction of each sheave between it and the standing-part.

The ratio which the friction of a pulley bears to the weight or pressure cannot be determined with any degree of accuracy on account of the great diversity of conditions in the material which is used; as, for example, the material of

which the rope is made,—its flexibility, state of dryness, whether tarred or untarred, etc.; also the materials of which the sheave and pin are made, and the relative diameter of each. It is known, however, that the friction of the pulley follows in all respects the laws by which the friction of sliding bodies is governed, which are, 1st. With the same materials and under the same conditions a constant ratio exists between the pressure of the surfaces in contact and the friction. 2d. With the same pressure and under the same conditions of surface the amount of friction is independent of the extent of surface. 3d. Friction is independent of the velocity of independent motion.

The friction of the pulley is greater than that produced by rolling bodies, and less than that of sliding bodies. It has been estimated that one-sixth of the power gained by each sheave is expended in overcoming friction, and the common rule is that the hauling-part of a fall bears double the strain of the standing-part when raising a weight. This estimate is, however, greatly reduced by the application of rollers to the sheaves of patent blocks. Loss of time is involved in any increase of power; or, *the velocity with which the applied power moves is to the velocity with which the weight rises as the number of parts of rope at the movable block is to unity.* Upon this law the convenience of using tackles of great lifting power often depends. The amount of power that may be applied—that is, the number of men that can be placed at the fall—may generally, within certain limits, be considered a known quantity, and upon this depends, in a great degree, the required power of a tackle, and hence the time in which a body can be lifted or moved. The inconveniences which arise from tackles of great power are loss of time and accumulation of fall by which the deck of a vessel would be encumbered.

Tackles of different sizes and power are used for the various purposes on shipboard, and they are generally named from the particular uses to which they are applied.

A single whip has one single fixed block.

A gun-tackle purchase consists of two single blocks.

A luff-tackle has a double and single block.

A twofold purchase consists of two double blocks, *a threefold purchase* of two treble blocks, etc.

A boom-jigger has usually a double and single block, and is used for rigging studding-sail-booms in and out on the lower yards.

A boom-tackle is a double purchase, and is used in fore-and-aft rigged vessels in guying out the main-boom over the quarter of the vessel with a fair wind.

A deck-tackle is a heavy double purchase used in heavy work about the deck, such as hauling in the cable, etc.

A fish-tackle is a heavy double purchase used in fishing the anchor.

A fore-and-aft tackle is used for stretching the backbone of an awning in spreading it. Any tackle may be thus designated, when for a special purpose it is used in a direction with the length of the vessel.

A griolet-purchase is used for dismounting guns on a covered deck. It consists of two tackles, called the muzzle-purchase and breech-purchase. The lower block of the former consists of a short cylindrical block of wood, one end of which fits into the muzzle of the gun, while sheaves are placed in the outer end. The lower block of the breech-purchase has connected with it a shackle which fits into the jaws of the cascabel. The upper blocks of both tackles are of iron, and have three sheaves.

A hatch-tackle is a small purchase used for hoisting articles from the store-rooms.

A jeer-tackle is a heavy purchase used in sending lower-yards up and down. By a recent improvement the upper jeer-block is connected with and forms a part of the slings of the yard, the chain being attached to the base of the block by a *slip-link.* This block being unwieldy from its size and weight is thus always hooked in place, and there is no loss of time in sending it aloft when required for use.

A jigger is a small tackle used for various purposes.

A rigging-luff, used in setting up rigging, has two single blocks.

A pennant-tackle is composed of a double and single block. It is kept hooked to the pennant under the top, and is used in staying the mast, steadying it in case of injury to the rigging, and other purposes.

A port-tackle is used in tricing up a lower-deck port of a ship of war.

A reef-tackle is used in reefing a topsail or a course.

Relieving-tackles are hooked to the tiller in order to relieve the wheel-ropes in heavy weather, when a great strain is brought upon them; or to steer the ship in case the wheel-ropes are injured in action.

A rolling-tackle is hooked to the quarter of a lower- or topsail-yard and to the mast, in order to relieve the strain of the yard upon the truss or parrel when the vessel is rolling heavily.

A rudder-tackle hooks to the rudder-pennants, by which a vessel may be steered in case of injury to the rudder-head.

A sail-tackle is the purchase used in hoisting a topsail from the deck to its yard in bending.

A side-tackle is used in running out a broadside gun. It consists of a double and single composition block, the latter being the movable block.

A stay-tackle is a heavy double purchase which is hooked to the triatic stay in hoisting out heavy boats.

A Spanish burton is a purchase much used in merchant vessels for handling cargo. The *single* Spanish burton has two single blocks. The leading-part of the fall comes from the lower or movable block, the standing-part leads from the upper or stationary block and is secured to the lower block, while the hook by which the burton is connected with the weight is fastened to the bight of the rope between the two blocks.

The double Spanish burton consists of one double and two single blocks, by which the lifting power is five times greater than the applied power.

A stock-and-bill tackle is a small tackle used in securing anchors for sea.

A tack-tackle is a heavy double purchase, sometimes used in setting the tack or weather clew of a course.

A top burton is a tackle generally used in the tops, but is of sufficient length for the lower

block and end of the fall to reach the deck. It is kept hooked to the pendant at the mast-head, and has the purchase of a luff-tackle, or a double and a single block. A fiddle-block is used in place of the double block, on account of the narrow space between the rigging and the mast-head.

A top-tackle is a heavy double purchase used in sending a topmast up or down.

A train-tackle is hooked to the rear of a broadside gun-carriage and an eye-bolt amidships, serving to run the gun in and prevent it from running out while being loaded. Two training-tackles are used in pointing a gun mounted on a pivot-carriage.

A watch-tackle is a small tackle convenient for any use as a jigger. The double block is usually fitted with a tail in place of a hook.

A winding-tackle is a purchase consisting of a double and single block, or two double blocks. It is used in hoisting heavy weights, being hooked to the eye of a top-pendant or other convenient rope at one of the lower yard-arms. The pendant, being rove through a block at the mast-head, is secured to the deck near the mast, and serves as a support to the yard-arm.

A yard-tackle is a heavy tackle hooked to a lower-yard and used in hoisting heavy weights. It is thus named to distinguish it from the stay-tackle, which is hooked to the stay.—*E. T. Strong, Lieutenant U.S.N.*

Tack-pin. A long belaying-pin used at the fife-rail.

Tack, Thumb-. A tack with a broad, flat head for attaching paper to a drawing-board.

Tactics. See NAVAL TACTICS.

Taffia. A kind of spirits distilled from molasses at Mauritius.

Taffrail. The rail about a vessel's stern.

Tail. A rope spliced around a block with an end of sufficient length to secure it to another rope, instead of a hook. A *tail-block* is a block strapped with a tail, which may be used as a leading block. A vessel *tails* inshore, offshore, up-stream or down-stream, when, being at anchor, her stern tends in that direction. *The tail of a gale* is the latter part of the gale, after the wind has commenced to moderate. *To tail on to a rope* is to man it. *To tail one rope on to another* is to bend or tie them together.

Tailor. A kind of fish resembling the shad, but inferior to it in size and flavor.

Tail-race. The disturbed water after leaving the paddles of a steamer. The channel that carries off the water from a water-wheel.

Tail-tackle. A watch-tackle.

Tail-up. Said of a whale when it shows its tail in diving. Also called *fluking*.

Tail-valve. A small auxiliary valve to aid in starting a large steam-engine by admitting steam to a cylinder when excluded by the main or cut-off valves. *Starting-valve* and *pass-over valve* are synonymous terms.

Taiste (*Eng.*). A name for the black guillemot.

Take. A take of fish is the amount that is caught at a single cast of the net. *To take a departure* is to observe the bearing and distance of a point of land, light-house, etc., before losing sight of the land. *To take in sail* is to reduce sail. *To take an observation* is to observe the altitude of a heavenly body for obtaining the latitude or longitude. *To take in water* is to ship water over the rail. The decrease of tides from the spring-tides is called their *taking off*.

Takel (*Ang.-Sax.*). An ancient name for the arrows which were supplied to vessels.

Take-up. A contrivance for adjusting the length of a connection between two points. The object may be accomplished by moving a bolt or pin from one of a series of holes to another; by a series of hooks; or by a *turnbuckle*, etc. A leak in a steam-boiler, or other vessel, is said to "take-up" when it stops, without manipulation, by the action of temperature, pressure, filling in of foreign matter, or corrosion.

Talero. A silver Venetian coin, equal in value to $1.00.

Tallant. The upper part of a rudder.

Tall Ship. A lofty ship; a former name for a square-rigged vessel.

Tang, or Tangle. A kind of sea-weed.

Tangent-screw. A screw acting at a tangent to the arc of a circle, by which a gradual motion may be given to a limb passing over the arc.

Tang-fish. A Scotch name for the seal.

Tangier, the diplomatic capital of Morocco, is situated near the western entrance of the Strait of Gibraltar, southeast of Cape Spartel, in lat. 35° 47′ 12″ N., lon. 5° 48′ 30″ W. It presents a very striking appearance from the sea, as it stands on a height near a spacious bay, and rises in the form of an amphitheatre. It is surrounded by walls, and defended by a castle and several forts. The harbor, which was once capacious and protected by a mole, was formerly frequented by vessels from nearly all maritime nations, but is now neglected, and the trade is confined chiefly to Gibraltar and the Spanish coast. Pop. 15,000.

Tangles. An instrument used in dredging, for obtaining the more minute forms of animal life from the bottom of the sea.

Tank. An iron structure for holding fresh water. It is cubical in shape, and usually contains about 600 gallons. A circular hole in the top, called a man-hole, is of sufficient size to admit a person for the purpose of cleaning and whitewashing. Small copper tanks are placed in the magazine for the stowage of powder. See POWDER-TANK.

TANK-TOGGLE. A short stout piece of wood placed inside the man-hole of a tank when it is to be hoisted, serving as a place to which the tackle can be attached.

Tanka. A covered Chinese row-boat, used in taking passengers to and from vessels.

Tanned Sails. Sails soaked in oak-bark.

Tap. A piece of tempered steel having an exterior screw-thread upon its surface, a portion of which is cut away by longitudinal grooves, for cutting interior or *female* screw-threads. It is provided with a square head for receiving a wrench. An orifice for withdrawing a fluid from a pipe, chamber, or reservoir. *To tap a buoy*, to empty the water from a buoy which has leaked in, causing it to float low in the water; to *bleed* a buoy. *To tap the admiral* (*Eng.*), an expression applied to a person who is willing to drink anything that he can obtain,—referring to the story of the theft of spirits from the cask containing the dead body of an English admiral.

Taper. To reduce the size of a rope to a point at the end, by cutting out the rope-yarns as required.

Tapered Cleat. A piece of timber bolted under beams to support them, in place of stanchions.

Tappet. In machinery, an arm or lever which is moved periodically by contact with a pin, roller, or other piece having a reciprocating motion; as, the *tappets* which actuate the steam-valves of the Cornish pumping-engine and other steam-pumps.

TAPPET-MOTION. A term applied to the valve-gear of a steam-engine when the valves are actuated by *tappets*.

Tar. A thick resinous substance obtained from pine wood, used upon rope to protect it from the weather and prevent dampness from penetrating among the fibres. Also, to cover or smear with tar. *Tar and feather*, an illegal mode of punishment, occasionally resorted to in extreme cases. During the reign of Richard I. of England it was a legal punishment for theft in the British navy. A sailor is sometimes called a *tar*.

TARBRUSH. *A touch of the tarbrush*, a description of the color of a person of mixed blood. *Tarred with the same brush*, said of men of a similar character; synonymous with "Birds of a feather."

TARRED LINE. Line to which tar has been applied.

Tarragona, a seaport city of Spain, is principally built upon a large rock at the mouth of the Francoli, in the Mediterranean. It is divided into two sections, an upper and lower town; is inclosed by walls and ramparts, and defended by two castles. Among the principal buildings are the academies of design and naval architecture. It has manufactures of coarse cloth, hats, barrels, etc., and a large export trade in wine, brandy, nuts, and cork. Pop. 19,000.

Tarbet. A Scotch name for a low spit of land dividing a lake from the sea.

Target. A mark for great gun or small-arm practice. The regulation target for great guns consists of a frame-work, made by two boards crossing at right angles, through the centre of which is secured an upright mast about 12 feet in height. Small ropes connecting the upper end of the mast with the ends of the crossed boards serve as stays, upon which the four triangular sails of the target are set. The target, when ready for use, is of the form of a pyramid. A small-arm target is of sheet-iron, having painted on its face the different inclosed squares by which the shots may be scored.

TARGET-FRAME. See TARGET.

TARGET-PRACTICE. The quarterly exercise of the crew of a vessel in firing at a target either with great guns or small-arms.

Targia. The ancient name for the *tartan*, a small vessel used in the Mediterranean.

Tarita. An ancient term for a vessel carrying a cargo.

Tarn (*Scotch*). A small mountain lake.

Tarpaulin. Canvas painted to render it waterproof, used as a covering for hatches, etc. Tar was formerly used instead of paint. Painted hats and coats for bad weather are also called tarpaulins.

Tarrock. A kind of gull (*Larus tridactylus*).

Tartan. A coasting vessel of small size, used in the Mediterranean. It carries one mast, upon which a lateen-sail is set.

Tartar. A commander with a bad temper. *To catch a tartar* is to mistake the force of an enemy and be obliged to surrender.

Task (*Eng.*). To examine a vessel regarding the soundness of her timbers. A timber is *tasked* by cutting or boring it with an auger to ascertain its condition.

Tasman, Abel Janssen. Exploring the coast of New Holland under instructions from Van Diemen, this Dutch navigator came (December 1, 1642) upon the island south of Australia, to which he gave the name of his patron, but which is now called Tasmania. Pursuing his investigations in the Southern Atlantic, he discovered New Zealand, and a group of islands then unknown to geographers.

Tasting Timber. Chipping it with the adze, or boring it with the auger, for the purpose of ascertaining its quality or defects.

Tattoo. The evening drum-beat before "piping down." To mark the body with indelible inks or dyes.

Taunt. Tall, as applied to the masts of a vessel.

Taurus, Constellation of (*Lat.* "The Bull"). The second constellation of the ancient zodiac, lying between Aries and Gemini. This group is easily identified in the heavens, as it contains the two beautiful little clusters of minute stars called the *Hyades* and the *Pleiades;* in the former is situated the bright ruddy star *α Tauri.* A line joining Aldebaran and Sirius is bisected by the middle star of Orion's Belt. *α Tauri*, Aldebaran; *β Tauri*, Nath; *η Tauri*, Alcyone.

Taurus, Sign of. The second division of the ecliptic, including from 30° to 60° of longitude. Owing to the precession of the equinoxes, the *constellation* Taurus is no longer in the *sign* of that name, the constellation Aries having taken its place. The sun is in Taurus from about April 20 to about May 21. Symbol ♉.

Taut (Ang.-Sax. *tought*). Tight, said of a rope. *On a taut bowline*, said of a ship when close-hauled, as the bowlines are then taut. *A taut hand*, a firm hand in matters of discipline. *Taut weather helm*, or *taut helm*, is caused by the trim of a vessel, or by want of balance of sail, by which the quality of ardency is given to the vessel. *Taut leech*, said of a sail when hoisted so as to make the leeches taut.

Taylor, J. Winthrop, Surgeon-General U.S.N. Born in New York. Appointed from New Jersey, March 7, 1838; entered the service as assistant surgeon; attached to sloop "Erie," West India Squadron, 1838–40; sloop "Marion," West India Squadron, 1842–43; sloop "John Adams," Home Squadron, 1845–48; receiving-ship, Boston, 1850; sloop "Dale," 1851–53.

Commissioned as surgeon, May 1, 1852; rendezvous, New York, 1854–56; sloop "St. Mary's," 1856–59; steam-sloop "Pensacola," West Gulf Blockading Squadron, 1861–63; naval rendezvous, Boston, 1864–66; fleet-surgeon, Gulf Squadron, 1866–67; fleet-surgeon, North Pacific Squadron, 1868–69; Naval Hospital, Chelsea, 1870–72; naval rendezvous, Boston, 1873–77; chief of the Bureau of Medicine and Surgery, 1878–79. Retired August 25, 1879; died January 19, 1880.

Taylor, William Rogers, Rear-Admiral U.S.N. Appointed midshipman, April 1, 1828. Promoted to passed midshipman, June 14, 1834.

Promoted to lieutenant, February 10, 1840.
Promoted to commander, September 14, 1855.
Promoted to captain, July 16, 1862.
Promoted to commodore, July 25, 1866.
Promoted to rear-admiral, January 19, 1871.
Retired by law, having attained the age of 62 years, November 7, 1873.

As midshipman he served on board the frigate "Hudson" and the sloop-of-war "Vandalia," on the coast of Brazil, from 1828–31, and on board the sloop-of-war "Peacock," on the coast of Brazil, in 1832.

As passed midshipman, on board the sloop-of-war "Peacock," in 1835 and 1836, in the East Indies.

As acting lieutenant, on board the schooner "Enterprise," in the East Indies and the Pacific Ocean, in 1836–37, and on board the line-of-battle ship "North Carolina," in the Pacific, in 1837–38.

As lieutenant, on board the steamer "Poinsett" and the brig "Oregon," engaged in a survey of Tampa Bay, under command of Lieut. L. M. Powell, in 1842–43. During a portion of that time he was in command of each of those vessels. Brig "Perry," on the coast of Brazil, in 1843–44; and the line-of-battle ship "Columbus," on the coast of Brazil, in 1844; sloop-of-war "St. Mary's,'" in the Gulf of Mexico during the Mexican war, in 1845–46; frigate "St. Lawrence," in the North Sea, in 1847; sloop-of-war "Albany," in the West Indies, in 1849–50; sloop-of-war "Saratoga," in the Atlantic Ocean, in 1855, from which ship he was detached for promotion.

As commander, he was ordered to the ship "Housatonic," but before sailing was promoted to captain.

As captain, in command of the "Housatonic," in the South Atlantic Blockading Squadron, in 1862–63; as fleet-captain with Admiral Dahlgren in 1863; and in command of the ship "Juniata," in the North Atlantic Blockading Squadron, in 1864.

As commodore, in command of the North Squadron of the Pacific Fleet in 1869–71, when he was detached on promotion.

As rear-admiral, in command of the South Atlantic Station in 1872–73, from which duty he was detached on being retired by law.

His duties on shore during his early naval life were performed at navy-yards, receiving-ships, the Naval Observatory, and the Naval Asylum. He was president of a board to revise and modify a code of regulations for the navy in 1863–64. In 1865–66, he was in charge of the ordnance-yard at Washington, then a branch of the Bureau of Ordnance. His total amount of bureau duty was 9 years and 5 months, as lieutenant, commander, captain, and commodore, embracing work at Alger's, Cold Spring, Tredegar, Bellona, Fort Pitt, and Hickory and Williams's foundries, and the foundries at Reading, Pa., and at Portland, Me.; in the Bureau of Ordnance, at the powder-works near Dover, N. H., and at South Acton, Mass., and at the Boston Navy-Yard.

On the assassination of President Lincoln, he was appointed one of a guard of honor to escort his remains from Washington to Springfield, Ill.

In 1868, he was a member of a board for the examination of officers for promotion; and in 1871–72, he was president of the Naval Board for examination and retirement, at the Navy Department.

The principal events of his naval life were as follows: When the "Peacock" was stranded on the island of Mazira, in 1836, he was sent in command of a cutter to convey Edmund Roberts, a diplomatic agent of the United States, from the ship to the port of Muscat, with the ratified copies of some treaties, which he was commissioned to exchange. The boat was single-banked, and pulled 5 oars; the voyage lasted about 5 days, and was not a perfectly safe one. At Muscat, he was invited by the imaum to take under his orders a sloop-of-war called the "Sultané," mounting 16 guns, and proceed to the relief of the "Peacock"; that ship had, however, in the mean time, been got off, and he fell in with her at sea.

On the 8th and the 15th June, 1846, the "St. Mary's" engaged a battery near the point at Tampico Bar, and he commanded the first division of guns on both occasions.

At the surrender of Tampico to Commodore Connor, he commanded the "St. Mary's" launch, which was a part of the attacking force.

During the siege of Vera Cruz, he commanded an 8-inch gun in the naval battery for 36 hours.

During the blockade of Charleston, he happened to be senior officer off that port when the rebel rams "Chocura" and "Palmetto" attacked the squadron, in January, 1863. He engaged one of them with the "Housatonic," but she withdrew over the bar. His ship formed part of the reserve fleet when Admiral Dupont made his attack upon the Charleston forts. When Admiral Dahlgren relieved Admiral Dupont, he was appointed fleet-captain, and served with Dahlgren in all the operations against Morris Island, from July 10 to the 19th, 1863. On the 16th he was in battle with him on board the monitor "Catskill," and again, on the 18th, in the monitor "Montauk."

On the 24th and 25th December, 1864, he commanded the "Juniata" in the attack upon Fort Fisher.

Admiral Taylor was a member of the Board of Visitors to attend the graduation of the class of midshipmen at the Naval Academy in June, 1860, and in January, 1872, he was president of the Board of Visitors to attend the graduation of the class at the Torpedo Station.

Teach. A term applied to the direction that any line points out.

Teak. A tree (*Tectonia grandis*) of East Indian growth, valuable for ship-timber.

Teal. A small wild duck of the species *Querquedula crecca.*

Team-boat. A side-wheel ferry-boat worked by horse-power.

Tea-wagon. An old name for the British East India Company's ships, tea constituting the greater part of their homeward-bound cargo.

Teazed Oakum (*Eng.*). Oakum prepared for use in calking.

Teeth. A fanciful name sometimes given to the guns of a vessel. It was more applicable to the batteries displayed by a ship of the line than to ships of more modern construction.

Telegraph-cables. The idea of submarine communication by means of electricity was entertained by some of the earliest electricians, but

no practical use was made of the discoveries in that direction until, by the inventions of Professor Morse in 1836, apparatus for the recording of telegraphic messages was introduced, and the practicability of communication by this means established.

Don Francisco Salva is said to have proposed the laying of a submarine cable between Barcelona and Palma, a port on the island of Majorca, in 1797, but the first cable or wire upon which experiments were actually made was constructed and operated by Dr. O'Shaughnessy, near Calcutta, in 1839. The wire was 21 miles in length, and insulated by a covering of tarred yarns, over which split rattan was placed, and over the rattan another covering of tarred yarns.

Professor Wheatstone, in 1840, before a committee of the English House of Commons, asserted the practicability of laying and operating a submarine cable between England and France, and in 1842 successful experiments were made by Professor Morse with a copper wire submerged between New York and Governor's Island, which was insulated by winding it with a hemp strand covered with a compound of tar, pitch, and india-rubber.

In a letter addressed to the Secretary of the Treasury by Professor Morse, in 1843, he said that, judging from his experiments of the previous year, telegraphic communication could with certainty be established across the Atlantic. In 1843, Samuel Colt also laid a wire from Fire Island to New York City, which was successfully used.

Experiments for the more perfect insulation of submarine cables followed these trials, and in 1845 a process of preparing gutta-percha for this purpose was patented in England, which material has been extensively used in the manufacture of submarine cables since that time. Its first use was upon a cable one-half of a mile in length, which was laid under the Rhine between Dentz and Cologne, and in 1846 a wire covered with the same material was laid between New York and Jersey City.

In 1850 a cable was laid across the Strait of Dover, 27 miles in length, from Dover to Cape Grinez. This was the first cable laid in the open sea, and it failed to transmit messages after the first day of its completion. Another was laid in the following year between Dover and Calais, which contained four conducting wires, each of which was insulated with gutta-percha, and these were covered with a layer of hemp, steeped in a solution of tar and tallow. In 1853 a cable 80 miles in length was laid between Dover and Ostend, which contained 6 conducting wires and weighed 5¾ tons per mile. In 1853 England and Holland were connected by a single insulated wire, 120 miles in length, weighing 1¾ tons per mile, which was in use for 12 years. From this time the use of submarine cables in connection with shore lines of telegraph-wires greatly increased, so that between 1853 and 1858 37 cables of various extents had been laid in Europe and its adjacent waters, with a total length of 3700 miles.

The brilliant undertaking of uniting America and Europe by a telegraphic cable was first attempted in 1857, and with this and succeeding attempts the name of Cyrus W. Field is inseparably connected. The U. S. S. "Niagara" and H. B. M. S. "Agamemnon" were employed in laying the first cable, but owing to the breaking of the cable the undertaking was not successful. In 1858 another trial was made, and the two parts were successfully united in mid-ocean, and the cable completed August 10. Congratulatory messages were exchanged between Queen Victoria and President Buchanan, and for 23 days the cable continued to transmit messages, although the signals were with difficulty understood, owing to the weakness of the current. At the end of this time the transmission of intelligible messages entirely failed, and the cable was finally abandoned. This cable was composed of 7 conducting wires,—6 laid around 1 central wire,—covered with 3 layers of gutta-percha. Outside of this a layer of tarred hemp was placed, and the whole surrounded by 18 strands of charcoal wire, each strand being composed of 7 wires, —6 laid around 1 central wire. The whole cost of this enterprise amounted to $1,834,500.

After this failure steps were taken for the laying of a cable from Labrador to Scotland, by way of Greenland, Iceland, and the Faroe Islands, and in 1860 soundings were taken of the proposed route by an English ship of war, and examinations made of the different coasts for the purpose of obtaining practicable landing-places for the ends of the cables. The required length by this route is 1800 miles, which could be divided into three sections of about 600 miles each. Although favorable reports of the feasibility of this route were made, no further steps were taken.

In 1862, Mr. Field again visited England, in order to make arrangements for carrying out his original design, which resulted in a third attempt to lay a cable between the coasts of Ireland and Newfoundland in 1864–65. The steamship "Great Eastern" was employed in this undertaking, but another failure was experienced on account of the breaking of the cable and the inability to recover the end. During the year 1866 another cable was laid by the same steamer, which was successfully completed July 27, and the cable of 1865 was also recovered and united, thus forming two lines of communication between Europe and America.

These cables lasted but about 8½ years, and in 1873 and 1874 two others, similar in construction, were laid, the work being successfully accomplished by the "Great Eastern," assisted by three smaller vessels. The work of laying the former was commenced June 16, 1873, and on June 27 the western end was landed at Heart's Content, 1700 miles having been payed out in 11 days. The latter extended from Ballenskilling's Bay, Ireland, to Nova Scotia, and thence to Rye, N. H., and was not completed until early in the summer of 1875.

In 1869 a cable was laid by the "Great Eastern" between Brest, France, and the island of St. Pierre, near the Gulf of St. Lawrence, and thence to Duxbury, Mass. The entire length of the two sections of the cable is 3047 miles. The weight of the section between Brest and St. Pierre is 400 pounds per mile, and that of the western section 107 pounds per mile. The conductor of both sections is composed of 6 copper wires laid around 1 central wire, which are insulated by alternate layers of gutta-percha and Chatterton's compound, covered with a coating

of tarred jute-yarns. Outside of this core galvanized iron wire, covered with manilla steeped in tar, is placed next a coating of mineral pitch and silica, called Clark's compound, and outside of all a layer of galvanized iron wire.

A cable was laid between the coasts of Ireland and Newfoundland in 1879, followed by another in the present year, in which the cores consist of homogeneous iron wires covered with two coats of yarn, pitch, and silica. During the past 20 years telegraphic cables have been laid in all parts of the world, and it is estimated that, at the present time, their total length is about 231,000 miles. Among the principal ones is that from Malta to Alexandria, Egypt, laid in 1861, 1518 miles long; the Persian Gulf cable, in 1864, 1330 miles long; the direct cable from Malta to Alexandria, in 1868, 1053 miles long; from Suez to Aden, 1460 miles; from Aden to Bombay, 1818 miles; and from Gibraltar to Malta, 1120 miles, in 1870. The completion of the China cable, in 1871, terminating in Japan, which, with its branches, connect the principal ports of China, Australia, and adjacent islands with western Europe; also the cables of the West India and Panama Company, 2613 miles long, the Panama and South Pacific cable, 1100 miles long, and that which connects the Windward Islands with Demerara during the same year; from Pernambuco to Para, in 1873, 1080 miles long; and from Lisbon to Madeira, in 1873, which, in 1874, was extended to Cape St. Vincent, on one of the Cape de Verd Islands, 1260 miles, and thence to Pernambuco, Brazil, 1953 miles. From these and other main lines of cables branches extend, in connection with shore lines of telegraph-wires, so that nearly all of the principal inland cities and seaports of the world are now in telegraphic communication.—*E. T. Strong, Lieutenant U.S.N.*

Telemeter. An instrument used for determining the distance of an object whose length is known, from its apparent length when seen between the parallel wires of a telescope.

Telescopic Funnel. A steamship smoke-pipe or funnel made in two or more sections, so arranged that one slides within another, in the manner of a telescope, for the purpose of lowering it clear of the sails and rigging when the ship is under sail alone.

Telescopium. See CONSTELLATION.

Tell Off. To count off or select men for a special duty.

Tell-tale. A small compass hanging from the deck overhead with its face downwards. It is generally placed in the cabin, where it can be conveniently referred to by the commanding officer. Also, an attachment to the steering-wheel, showing the position of the tiller. *Tell-tale shake*, the shaking of a rope from aloft as a signal to let it go, in place of hailing from aloft.

Tell that to the Marines! An exclamation of doubt as to the truth of a statement.

Temple, William Grenville, Commodore U.S.N. Born in Vermont, March 23, 1824. Appointed acting midshipman from Vermont, April 18, 1840; ordered to receiving-ship "Columbus," Boston, September 24, 1840; detached from "Columbus" and ordered to frigate "Constellation," Boston; May 8, 1844, detached from "Constellation" at Norfolk, and granted leave of absence; August 21, 1844, ordered to frigate "Potomac," flag-ship of the Home Squadron, Philadelphia; March 14, 1845, detached from "Potomac" at Pensacola, and ordered to brig "Lawrence" at same place; October 21, 1845, detached from "Lawrence" at Pensacola, and ordered back to "Potomac" at same place; December 5, 1845, detached from the "Potomac" at Norfolk, and ordered to Naval School, Annapolis.

Promoted to passed midshipman, July 11, 1846; July 13, 1846, detached from Naval School; October 5, 1846, ordered to sloop-of-war "Boston"; November 15, 1846, wrecked on west end of Eleuthera, one of the Bahamas, opposite Hole-in-the-Wall; November 29, 1846, ordered to Norfolk in schooner "Volant," in charge of sick men from wreck of the "Boston"; January 7, 1847, ordered to receiving-ship "Pennsylvania," Norfolk; February 4, 1847, detached from "Pennsylvania," and ordered to steamer "Scourge," New York; March 29, 1847, present at the surrender of Vera Cruz; March 31, 1847, present at the capture of Alvarado by the "Scourge," and ordered to take command on shore; April 1, 1847, relieved on shore and ordered back to the "Scourge"; April 18, 1847, present at the capture of Tuspan; June 15 and 16, 1847, present at the capture of Tabasco; November 27, 1847, detached from the "Scourge" at Frontera; December 25, 1847, ordered as acting master to the steamer "Mississippi"; April 21, 1848, detached from the "Mississippi"; June 14, 1848, ordered to Naval Observatory, Washington; May 2, 1849, detached from the Observatory, and ordered as acting master to the coast survey schooner "Petrel," New York; transferred at New Orleans into the coast survey steamer "Hetzel"; August 2, 1850, detached from the "Hetzel," and ordered to the Coast Survey Office; October 11, 1850, detached from the coast survey, and ordered to the Observatory; November 28, 1850, detached from the Observatory, and granted leave of absence for the purpose of taking charge of the hydrographic works on the survey of the Isthmus of Tehuantepec, for a railroad and canal; April 5, 1852, ordered as acting master to the sloop-of-war "Levant."

Promoted to master, July 21, 1854.

Promoted to lieutenant, April 18, 1855; May 7, 1855, detached from the "Levant"; June 4, 1855, ordered to the steamer "Corwin," coast survey; December 3, 1855, detached from the "Corwin" and ordered to the Coast Survey Office; May 19, 1856, detached from Coast Survey Office, and ordered to the steamer "Corwin," coast survey; June 1, 1857, succeeded to the command of the "Corwin"; October 11, 1858, detached from command of the "Corwin," and ordered to the Coast Survey Office; April 7, 1859, detached from the Coast Survey Office, and ordered to the steam-frigate "Lancaster," flag-ship of the Pacific Squadron; October 11, 1861, detached from the "Lancaster," and ordered to return to New York; November 11, 1861, ordered to command the steamer "Flambeau"; January 22, 1862, detached from command of the "Flambeau"; February 26, 1862, ordnance duty, New York.

Promoted to lieutenant-commander, July 16, 1862; September 22, 1862, detached from ordnance duty, and ordered to command the steam-gunboat "Pembina," and to join the West Gulf Blockading Squadron; November 22, 1862, de-

tached from command of the "Pembina," and ordered to Key West as fleet-captain of the East Gulf Blockading Squadron; April 10, 1864, ordered temporarily to command the flag-ship "San Jacinto," for special service; April 13, 1864, detached from command of the "San Jacinto," and ordered to resume duty as fleet-captain; July 12, 1864, present on duty in the trenches about Washington, on the occasion of Gen. Early's attack; September 19, 1864, detached from fleet-captaincy, and ordered to ordnance duty at Cold Spring Foundry; November 8, 1864, detached from ordnance duty, and ordered to command the steamer "Pontoosuc," and to join the North Atlantic Blockading Squadron; December 24 and 25, 1864, present at the bombardment of Fort Fisher; January 13 to 15, 1865, present at the capture of Fort Fisher; February 18 to 22, 1865, present at the passage up the Cape Fear River, and the capture of Wilmington, N. C.

Promoted to commander, March 3, 1865; April 1, 1865, present at the bombardment of rebel fortifications on the James River, above Dutch Gap; April 3, 1865, present at the capture of Richmond, Petersburg, etc.; May 25, 1865, detached from command of the "Pontoosuc," Hampton Roads, and granted leave of absence; August 17, 1865, ordered to command the steamer "Tacony," and to join the Atlantic Squadron; October 31, 1866, detached from command of the "Tacony," and ordered as inspector of ordnance to Portsmouth, N. H.; October 18, 1869, detached from ordnance duty at Portsmouth, and ordered as member of Permanent Ordnance Board, at the Navy Department.

Promoted to captain, August 28, 1870; October 18, 1870, detached from ordnance duty, and ordered as assistant judge-advocate of the navy; December 23, 1870, detached from the Navy Department, and ordered to command the frigate "Tennessee"; April 25, 1871, detached from the "Tennessee"; May 1, 1871, ordered to duty under the Bureau of Ordnance; October 5, 1871, detached from ordnance duty, and ordered to flag-ship "Wabash"; July 6, 1872, ordered to command the "Wabash"; May 31, 1873, detached from the "Wabash," with leave of absence for 18 months, and orders to return to the United States at its expiration; December 11, 1874, ordered to take charge of the government's reception of the king of the Hawaiian Islands at Washington, for which service, by permission of Congress, received from his majesty Kalakaua a decoration as Knight Commander of the Royal Order of Kamehameha I.; relieved from this duty on December 28, 1874; February 1, 1875, ordered, as captain of the yard, to New York Navy-Yard; October 31, 1877, detached from New York Navy-Yard, and placed on waiting orders.

Promoted to commodore, June 5, 1878; October 26, 1878, ordered to Montevideo, South America, for temporary duty on board the flag-ship "Hartford"; February 15, 1879, detached and placed on waiting orders; October 22, 1879, member of the Examining and Retiring Board, which is his present duty.

Templet, or Template. A mold in wood, or an iron plate cut to any particular shape by which other materials are shaped.

Temporary Star. One that having become visible, increases gradually in brilliancy and then slowly disappears.

Tench. The *Tinca vulgaris*, a fresh-water fish.

Tender. A small vessel used for giving assistance to a large ship or a flag-ship, as carrying stores or dispatches, transferring men, etc.

Tenon. The shoulder at the end of a piece of timber which fits into a mortice; as, the tenon at the heel of a mast.

Ten-pounder. The name of a fish found in the West Indies.

Teredo Navalis. A worm found in the sea which is very destructive to submerged wood. It is a genus of testaceous mollusks, and has been seen at a depth of 10 fathoms.

Term-piece. A piece of carved work placed upon the stern, extending from the taffrail to the foot-rail of the balcony.

Tern. A sea-bird of the genus *Sterna*, resembling a gull.

Terrada. A large Persian boat.

Terrapin. A large turtle of the genus *Chalonia*, found in salt water.

Tertiate. To examine the thickness of the metal of a gun to ascertain its strength and prove the proportions at different parts.

Test-cock. A cock for withdrawing a small quantity of fluid from a vessel or chamber in which it is confined, for the purpose of observing its condition.

Testone. A former Papal coin, issued in 1785, in value about $0.32.

Testoon. A Portuguese coin, about $0.13 in value.

Tew (*Eng.*). To beat hemp in preparing the fibre.

Thatcher, Henry K., Rear-Admiral U.S.N. Born in Maine, at the seat of his grandfather, Maj.-Gen. Henry Knox, of Revolutionary memory. Appointed midshipman from there, March 4, 1823; Washington Navy-Yard during that year (which was very active in equipping the so-called Mosquito Fleet of Commodore David Porter, to attack the pirates of the West Indies), from thence to frigate "United States," under Commander Isaac Hull, until May, 1827.

Promoted to passed midshipman, March 23, 1829.

Promoted to lieutenant, February 28, 1833; served at various navy-yards and on board different vessels from 1833 to 1855.

Promoted to commander in February, 1855; commanding sloop-of-war "Decatur," Pacific Squadron, from 1855–57; executive-officer, Boston Navy-Yard, 1860–61; commanding sloop-of-war "Constellation," coast of Europe and Mediterranean, 1862–63, as a commander.

Promoted to commodore during this command. Relieved July, 1863, and ordered home to command steam-frigate "Colorado" and division of Southern blockade; commanded first division of Porter's squadron in the attacks and capture of Fort Fisher and dependencies, in December, 1864, and January, 1865; after which he was ordered to command of the West Gulf Squadron as acting rear-admiral, and at once commenced active operations for the capture of Mobile and coast of Texas, in co-operation with the land-forces under Gen. Canby. After a vigorous bombardment, Forts Alexis and Spanish Fort were carried by assault by the army on the night

of April 9, 1865, leaving the minor works a comparatively easy prey,—the Forts Tracy and Huger, near Tracy and Huger, made a spirited resistance until the night of the 11th, when their garrisons made their escape through the marshes and in boats. On the following day flags of truce were discovered at the landing, and the announcement made that the rebel Gen. Maury had evacuated the city with all his army; a formal demand was at once made by Gen. Granger and Acting Rear-Admiral Thatcher for the surrender of the city, which was unconditionally complied with. The rebel naval forces, under Flag-Officer Ebenezer Farrand, consisting of the ironclad frigate "Nashville," sloop-of-war "Morgan" (partially ironclad), the ironclad ram "Baltic," the steamer "Black Warrior," and the rams "Tuscaloosa" and "Huntsville," fled to the river Tombigbee, and sinking the two last named in the channel. Our forces afloat being about to pursue them, Farrand proposed terms of surrender, which having been accepted by Acting Rear-Admiral Thatcher, a suitable force under Commander Edward Simpson (fleet-captain) was dispatched by him to take possession and bring them with their officers and men to the city. In May, 1866, Commodore Thatcher was relieved from the Gulf and ordered to the command of the North Pacific Squadron, in which command he remained until relieved, in August, 1868.

Commissioned as rear-admiral, July 25, 1866; port-admiral, at Portsmouth, N. H., 1869–71. Retired May 26, 1868; died 1880.

Theodolite. An instrument used in surveying, for measuring angles, leveling, etc.

There Away. In that direction.

Thermal Unit. A unit of heat; or, the quantity of heat that will raise a unit of weight of matter through a unit of temperature. The English *thermal unit* is the quantity of heat that will raise one pound of pure water at its maximum density, and temperature of 39.1°, one degree F.

Thermometer. An instrument for indicating comparative temperature. In its common form it consists of a capillary glass tube, hermetically sealed at one end and having a bulb blown at the other, thoroughly filled with mercury or colored alcohol at a higher temperature than the instrument is intended to indicate or is likely to be subjected to, a Torricellian vacuum being formed above the liquid when it contracts to lower temperatures. The tube is attached to an arbitrarily graduated scale, usually that of Celsius, Fahrenheit, or Réaumur, the *range* or expansion of the liquid between the temperature of melting ice and that of boiling water being divided, respectively, into degrees of 100, 180, or 80 parts. The zero of the Celsius (*Centigrade*) and Réaumur scales is the temperature of melting ice; that of Fahreheit, 32° below. In delicate physical investigations an *air thermometer* is employed.

The thermometers in use on shipboard for meteorological purposes are the *dry bulb*, from which the temperature of the air is noted; the *wet bulb*, which, by comparison with the dry bulb, gives the amount of moisture in the atmosphere; and the water thermometer, which is used in obtaining the temperature of sea-water. A *maximum* and *minimum* thermometer is one that regulates the extremes of temperatures. A *deep-sea* thermometer is used to obtain the temperature of sea-water at great depths, and is constructed so as to resist the pressure of water at such depths.

Thick-and-dry for Weighing. An expression indicating that the nippers should be placed close together on the cable, and as dry as possible, to prevent the slipping of the cable when the anchor breaks ground.

Thick-and-thin Block. A block having two sheaves of different sizes, one above the other. Also called a fiddle-block.

Thick-stuff. Planking used in ship-building, between 4 inches and 1 foot in thickness.

Thieves' Cat (*Eng.*). A cat-o'-nine-tails with knots upon the lashes, which is applied as a punishment for theft.

Thimble. An iron ring, the outer surface of which is concave in order that it may be held in position by a rope when spliced around it. It thus serves as a lining for the rope, and protects it from the chafe of a hook or other thimble.

A *lock-thimble* is formed by two thimbles which are interlocked.

THIMBLE-EYES. Holes shaped like thimbles made in an iron plate; formerly used in place of dead-eyes for setting up topmast rigging.

Thokes (*Eng.*). Fish with broken bellies, which are not allowed to be packed with the unbroken, or *tale* fish.

Thole, or Thole-pin. A pin, either of wood or metal, fixed to the gunwale of a boat to retain the oar in place when rowing, and which serves as the fulcrum of the lever. The oar may be placed between two such pins, or secured to a single pin by means of a grommet.

Thorn-back. The fish *Raia clavata.*

Thorough-foot. The disarrangement in the parts of a tackle-fall caused by turning or capsizing one of the blocks through the parts.

Thorough-put. A *thorough-foot* (which see).

Thrasher. The shark *Carcharias vulpes.* The name is also applied to the grampus on account of its supposed mode of attack with its tail.

Thread. To follow the course of a narrow, tortuous channel.

Three-cocked-hat. An old style of hat formerly worn by naval officers.

Three-decker. A ship fitted for carrying guns upon three decks.

Three Half-hitches are more than a King's Yacht wants is an exclamation peculiar to the English service, meaning that two are enough for any purpose.

Three Sheets in the Wind is descriptive of the condition of a person partially intoxicated.

Three Sisters (*Eng.*). The three rattans formerly carried by the master-at-arms and boatswain's mate.

Three-square. A surface bounded by three sides; as, a three-cornered sail.

Thrift (*Eng.*). The *Armeria*, a plant found near the coast.

Throat. That part of a gaff which is next to the mast. Also applied in ship-building to the midship portion of the floor-timbers, knees, breast-hooks, etc.

THROAT-BOLT. An eye-bolt either on the throat of a gaff or under the top, into which the throat-halliards are hooked.

THROAT-BRAIL. One of the ropes or brails by

which a trysail or spencer is gathered up to the throat of the gaff when the sail is taken in.

THROAT-HALLIARDS. The tackle by which the throat of a gaff is hoisted.

THROAT-SEIZING. The seizing nearest the dead-eye, connecting the end part of a shroud or backstay with the standing part. Also, the seizing by which the strap of a block is made to fit into its score.

Throttle-valve. A valve situated in the steam-pipe for regulating the admission of steam to an engine. It generally consists of a disk arranged to rotate about one of its diameters, the *throttle-valve-stem*, or axis, being attached to suitable levers and handles.

Through All. Sail is carried "*through all*" when it is not reduced to a squall. Formerly, when the anchor was weighed by means of a messenger, the cable was said to "heave through all" when the nippers, being wet and slippery, did not secure the cable to the messenger.

Through-bolt. A bolt which is driven through and through the sides of the ship, and is riveted on the inside upon clinch-rings.

Through-fastening. A bolt passing through timber and planking.

Through the Fleet. A former mode of punishment in the English navy, sometimes given for serious offenses, in which the offender was towed to each vessel in the fleet, where he received a part of the lashes to which he had been sentenced.

Thrums. Short bits of rope-yarns used in making mats. A *thrummed mat* is made by sewing short pieces of yarns to one side of a piece of canvas or heavy cloth, and is used in protecting sails and rigging from chafe.

Thrust. A force which acts between two contiguous bodies, or parts of a body, when each pushes the other from itself, and which tends to *compress* or shorten each body on which it acts in the direction of its action. It is the kind of force which is exerted by a fluid tending to expand against the bodies which surround it.

THRUST-BEARING. A bearing that receives a force acting in the direction of the axis of a shaft; as, the bearing that transmits the propelling force of a screw-propeller to the hull of a vessel.

Thuban. The star *a Draconis.*

Thule. The ancient name applied to the extreme north.

Thumb-cleat. A cleat used on a topsail-yard to prevent the turns of the reef-earing from slipping in on the yard.

Thumb-stall. A leather covering worn on the thumb by a captain of a gun to protect it from heat in serving the vent.

Thunder-squall. A squall accompanied by thunder and lightning.

Thunny. See TUNNY.

Thus, Very well Thus, or Dice. An old order to the helmsman, the ship being close-hauled, to steer as the ship heads. It is seldom used at the present day but by the oldest of quarter-masters.

Thwart. The seat in a boat upon which the rower sits.

Thwart-marks. Objects on shore near the coast, which being in line indicate the channel or the direction of shoals.

Thwart-ships. Athwart-ships (which see).

Tibric (*Eng.*). An old name for the coal-fish.

Ticket, Hospital. The document which accompanies a person in the naval service when sent to a naval hospital from a vessel, in which is stated the disease or injury under which the patient is suffering, and the evidence, if any, that said disease was contracted, or the injury received, in the line of duty. It also contains the descriptive list of the patient, and a list of clothing accompanying him. The ticket is signed by the medical officer of the vessel, and approved by the commanding officer of the vessel and the commandant of the station.

Tides (Sax. *tidan*, to happen; from *tid*, time). Semidiurnal oscillations of the ocean occasioned by the combined action of the sun and moon. The relative effects of these two bodies are directly as their mass, and inversely as the square of their distance, and the moon, although very small in comparison with the sun, is so much nearer that she exerts by far the greater influence on the phenomena of the tides.

The attraction of the moon on different parts of the earth is less as the distance is greater, and thus it influences the parts of the ocean nearest to her more powerfully than the body of the earth, and this again more powerfully than waters most remote. The particles of water under the moon have a tendency to leave the earth, but are retained by the superior attraction of the earth; again, the moon attracts the centre of gravity of the earth more powerfully than she attracts the particles of water in the hemisphere opposite to her, so that the earth has a tendency to leave these waters, which are retained, however, by the superior attraction of the earth. The effect of this difference of the attractions on the superficial water on opposite sides and on the central mass is two risings of the water, the one vertically below the moon, and the other diametrically opposite to this place. If the earth were entirely covered with an ocean, the waters would thus assume the form of an oblongated spheroid, having, if the earth had no rotation, its longer axis directed towards the moon and its shorter axis at right angles to that direction. As the moon in her apparent diurnal motion looks down successively upon each meridian, the protuberance of the ocean follows its motion from east to west; but by reason of the inertia of the water, this occurs at a meridian about 30° to the east of the moon. This great wave, following all the motions of the moon, is modified by the action of the sun. The sun raises a similar but much smaller wave, which tends to follow his motions, and which consequently at times combines with the lunar wave and at other times opposes it, according to the relative position of the two bodies. It must be particularly noted that the bodies do not draw after them the water first raised, but continually tend to raise that under them at the time. The tide is not a circulating *current*, but an immensely broad and excessively flat *wave*, which is propagated by the transits of the disturbing body. As this wave strikes the coasts the water gradually elevates itself to a certain height, then as gradually sinks to about the same extent below its mean level; and this oscillation is continued constantly, with certain variations in the height and in the times of attaining the maxima of elevation and depression. Considering the tides relatively to the whole earth and open seas, on the meridian

about 30° to the east of the moon there is high-water, on the west of this circle the tide is flowing, on the east it is ebbing, and on every part of the meridian at 90° distant it is low-water.

TIDES, NEAP- (Sax. *neafte*, scarcity). The smallest tides, being the result of the action of the moon and sun when they are conflicting. They take place after the moon is in quadratures, —*i.e.*, after the first and third quarter of the moon. The *smallest neap-tides* happen when the moon's and sun's attractions tend most to counteract each other, which will happen when the moon's action is the least possible and the sun's the greatest possible. This will evidently be—(1) When the moon is in apogee and the earth in perihelion at or near the same time; or, in other words, as the parallax of a body indicates its proximity to the earth, when the moon's parallax is the least, while the sun's is the greatest. (2) When the moon's declination and the latitude of the place are of different names, and the declination the greatest possible, at the same time that the sun's declination coincides or approximates to the latitude of the place, both being north or south; or, in other words, when the moon's altitude is the least possible and the sun's the greatest, the action being the more powerful in proportion as the body is more nearly vertical. The magnitude of the tide is also affected by strong winds and the state of the atmosphere. The action of the former is most conspicuous in rivers and narrow seas, and of the latter it has been observed that a rise in the barometer of an inch has been accompanied by a depression in the water of the tide of 12 or 14 inches.

TIDES, SPRING- (Sax. *springan*, to grow, bulge). The greatest tides being the result of the action of the moon and sun when they are co-operating, they take place after the moon is in syzygies,—*i.e.*, in conjunction or opposition, when it is new and full moon. The *greatest spring-tides* happen when the moon and sun are in such positions that their attractions produce the greatest effect upon the waters, especially when these positions are contemporaneous. These are—(1) When the moon is in perigee; when the earth is in perihelion. In other words (as the parallax of a body indicates its proximity to the earth), the effect of each body in raising the tide is greater as its parallax is greater. (2) When the moon's declination coincides with or approximates to the latitude of the place, both being north or south; when the sun's declination fulfills the like condition. In other words (as, generally speaking, the vertical action is the most powerful), the effect of the two bodies is greater as their altitudes are greater. The magnitude of the tide is also affected by strong winds and the state of the atmosphere; favorable winds and a low barometer are the meteorological conditions which augment the tides.

TIDE, SUPERIOR AND INFERIOR. The *superior tide* is that which takes place in the hemisphere which has the moon above the horizon; the *inferior tide* is that which happens simultaneously in the hemisphere which has the moon below the horizon.

TIDE-WAVE. The accumulation of the waters of the sea which is caused by the action of the moon, modified by that of the sun, changes its position through the day. The moon and sun in their diurnal revolutions continually and successively tend to raise the water beneath them at the time, and thus the alteration in the level of the sea is propagated from east to west, though there is no transference of the water itself except near the shore. Interruptions in the regular propagation of the tide-wave are caused by the depth of the ocean and the barriers presented by land stretching athwart its direction.

TIDE-CURRENT. The current in a channel caused by the alteration of the level of the water during the passage of the tide-wave. The tide-current does not generally change with the tide; thus, under certain circumstances, the current of the ebb continues to run for some hours after the flood-tide has made.

TIDE, RANGE OR HEIGHT OF. The difference between the level of high-water and that of low-water. Speaking of the earth at large, the range is greater in those latitudes over which the moon and sun pass vertically, being very small in high latitudes. In the open ocean the range is inconsiderable, and in inland seas almost insensible. It is most affected by local causes, as the shoaling of the water and the narrowing of the channel, especially if the channel opens in the direction of the tide-wave.

TIDE, RETARD OR AGE OF. The interval between the transit of the moon, at which a tide originates, and the appearance of the tide itself. It is found in general that any particular tide is not due to the moon's transit immediately preceding, but to a transit which has occurred some time before, and which is said therefore to correspond to it. The *retard of the tide* is thus distinguished from the *lunitidal interval*, which is the interval between the moon's transit and the high-water next following. The name *retard* is derived from the tide appearing to be "retarded" in following the moon in her diurnal course. The cause of the phenomenon may, however, be best understood by regarding the actual rotatory motion of the earth on its axis, instead of the apparent diurnal revolution of the moon in the heavens. The *momentum* of the water will cause a continuance of its rise long after it has passed under the excited cause. On the same principle, changes in the parallax and declination of the sun and moon produce their several effects on the time and height of the tide, not immediately, but after certain intervals.

TIDE, TIDE AND HALF-TIDE, TIDE AND QUARTER-TIDE. In the open sea high- and low-water succeed each other at intervals of about 6^h 12^m; such interval is designated "a tide." In channels where a tide-current is formed, when the stream continues to flow up for 3^h after it is high-water, it is said to make "a tide and half-tide"; if it continue to flow during 1^h 30^m after high-water, it is said to make "a tide and quarter-tide," and so on.

TIDE-DAY, PRIMING AND LAGGING. The tide-day is the interval between two successive arrivals at the same place of the same vertex of the tide-wave. It varies in length as the waves due to the separate action of the moon and sun approach to or recede from coincidence, the resultant maximum being at a point intermediate between them. The lengthening and shortening of the tide-day on its mean is called the *priming* and *lagging* of the tide.

TIDE ESTABLISHMENT OF THE PORT. The sun

and moon being in the same relative position, the time of high-water is different for different ports, owing to the inertia of the water and the obstructions it meets with from the friction of the sea-bed, and the narrowness, length, and direction of the channels along which the wave has to travel before reaching the port. It is of great maritime importance to be able to find the time of high-water for harbors and ports, and to this end a standard tide is fixed upon, indicated by a particular relative position of the moon and sun, from which the time of every tide may be deduced. This standard is called the *establishment of the port*, and is the time of high-water at full and change of the moon at the given port reckoned from apparent noon. It is the actual time of high-water when the moon passes the meridian at the same time as the sun, or the interval between the time of transit of the moon and the time of high-water on full or change days. It may be determined roughly by observation on the day of full or change, and is, in this case, distinguished by Whewell as the *vulgar establishment of the port.* The *corrected establishment of the port* is the interval between the time of the moon's transit and the time of the tide not *on* the day of syzygy, but *corresponding to* the day of syzygy. It may be determined by observing the intervals of the times of the moon's transit and the times of tide every day for a semi-lunation, and taking the mean of these. If we know by how much the transit of the moon to which the tide corresponds is antecedent to the transit next preceding the tide, the corrected establishment may be obtained from one observation of any tide. The establishment of the port is spoken of by Robinson as "the time of the syzygie high-water for the given port," which may be abbreviated into *syzygy tide;* similarly, it has been called the *change tide.*

Tie. That part of the purchase for hoisting a topsail-yard which is attached to the yard and passes through the sheave-hole in the mast, or the tie-block at the mast-head. *Tie of a cartridge*, the end of the cylinder secured by a woolen thrum after the cartridge is filled.

Tie-for-tie. A former expression indicative of exchange of courtesy and good-will, handed down from the days when cues were worn, and tying required to be performed by another.

Tier. A row or layer; as, the upper or lower tier of casks. The *cable-tier* is that part of a vessel's hold where the hawsers or hemp-cables are stowed.

TIERER. A man stationed in the chain-locker to stow the chain; but formerly, one stationed in the cable-tier for the stowing of hemp-cables,—hence the name.

TIER-SHOT. Grape-shot in which the several layers or tiers are secured by parallel iron plates.

Tierce. A cask of the capacity of 42 wine gallons. Also, a measure of the same amount. A cask used in packing salt provisions, containing 336 pounds.

Tie-ties. Stops of small cord, sometimes used in securing a hammock, in place of a hammock-lashing.

Tight. Free from leaks; applied either to a cask which retains a liquid or to a ship which excludes it. *Taut* is used in place of *tight* when speaking of a rope upon which there is a strain.

Tiller. An iron or wooden bar fitting into the socket near the rudder-head, which forms the lever by which the rudder is moved.

TILLER-HEAD. The end of the tiller farthest from the rudder.

TILLER-ROPES, or WHEEL-ROPES. Ropes which connect the tiller with the wheel. They are usually made of hide. Small chains or wire-ropes are sometimes used for that purpose in merchant steamers.

TILLER-SWEEP. See SWEEP.

Tilt (*Eng.*). A small awning sometimes used to protect the stern of a boat.

TILT-BOAT (*Eng.*). A boat covered with canvas, in which articles can be protected from the weather.

Timber. A name given to any of the pieces of timber which compose the frame of a ship; as, floor-timbers, futtock-timbers, top timbers, etc.

TIMBER AND ROOM. The space from the centre to the centre of the frames.

TIMBER-HEADS. Projecting timbers for belaying towing-lines, etc.

TIMBER-HITCH. A hitch made by passing the end of a rope around an object, then over and under the standing part, and securing the end from slipping by taking two or three turns around its own part.

Time. A definite portion of duration. It is marked, in a general manner, by the recurrence of striking natural phenomena, such as the alternations of light and darkness, and the succession of the seasons. Thus the two natural measures of time are the *day* or period of the earth's rotation on her axis, and the *year* or period of the earth's revolution in her orbit. See CALENDAR.

Time, in the abstract, is reckoned from an epoch (or initial instant) independent of local situation, —such is that known among astronomers as *equinoctial time*, which is the same for all the inhabitants of the earth. *Local time* is reckoned at each particular place from an epoch determined by local convenience, such as the transit of the sun's centre over the meridian of the place; what is called *Greenwich time* and *ship-time* are both examples of local time.

The day depends upon the rotation of the earth on her axis, but this is indicated to a spectator on the surface only by the apparent revolution of the celestial sphere in the opposite direction. Diurnal time is, therefore, defined by the motion of some chosen point in the heavens as it appears to revolve from east to west, and is measured by *the angle at the pole of the heavens between the celestial meridian and the hour-circle passing through the point of definition, reckoning westward.* Thus we have *sidereal time*, *apparent solar time*, and *mean solar time*, according as the point of definition is the first point of Aries, the actual sun, or the mean sun.

TIME AZIMUTH. An azimuth determined by calculation from the latitude, the declination, and the hour-angle. An *altitude azimuth* is an azimuth determined by calculation from the latitude, the declination, and the altitude.

TIME-BALL. A ball attached to a mast or staff, placed in a position where it can be easily observed. The ball is dropped on its staff at a certain instant of mean time, usually at meridian, and affords an opportunity for correcting chronometers.

TIME-FUZE. A fuze so constructed as to burn

a certain number of seconds after ignition by the flame from the charge, exploding the shell at the end of that time.

TIME-KEEPER. An instrument for the measuring of time.

TIME, SHIP-. The mean solar time at the place where a ship happens to be, as contrasted with *Greenwich mean time.*

TIME-SIGHT. The name usually applied to an observation of the altitude of a heavenly body for the purpose of obtaining the mean time of observation, from which the longitude is deduced.

Timenoguy. A rope stretched from one place to another to prevent gear from becoming foul. That most commonly used extends from the fore rigging to the anchor-stock to keep the fore tack and sheet clear of the anchor-stock in tacking. The pendant which extends from the mizzen-top to the main-brace block as a support to the latter is sometimes called by the same name.

Timonogy. A gauge or tell-tale formerly used in large ships, by which the position of the tiller could at all times be known.

Tindal. A Lascar boatswain's mate.

Tinker (*Eng.*). A small mortar which was formerly used in ships of war. Also, a mackerel of small size; also called skate.

Tinkerman (*Eng.*). A name formerly applied to fishermen of the Thames who took fish with nets, contrary to law.

Tin-potter. A galley skulker.

Tip All Nines (*Eng.*). To founder; the result of carrying too much sail.

Tippet (*Eng.*). A snood on a fishing-line.

Tip the Grampus. To duck a look-out for being asleep.

T-iron. Bar-iron having a cross-section of the form of the letter T.

Titivate. To clean and put to rights.

T-joint. In pipe-fitting, a joint by which three pieces of pipe are connected in the form of the letter T; two pieces being continued on the same axis, and the third branching at right angles therefrom.

Toad-fish. The *Lophius piscatorius*, or fishing-frog.

Tobacco-chart (*Eng.*). The name formerly given to a worthless kind of chart sold by ship-chandlers.

Tod-boat. A Dutch fishing-boat.

Toddy. The juice extracted from the palm and sometimes called palm-wine. Also, a mixture of spirits, sugar, and water.

Toe a Seam. To stand on deck without moving,—a punishment sometimes given for minor offenses.

Toggle. A piece of wood varying in size and strength, used for connecting two ropes in place of a hook. The toggle being fixed to the end of one rope is passed into the eye made in another, like a button. By this means bowlines are fastened to their bridles, and buntlines to the foot of a topsail or course. Toggles are frequently fastened to the lower and topsail braces to prevent them from unreeving from the brace-block on the yard-arm in case of injury to the brace. A heavy toggle is used by whalers for attaching the blubber to the lower purchase-block in "cutting in," it being more easily handled than a hook.

TOGGLE-BOLT. A bolt used in confining an iron band or strap in its place; as, the band by which a boat's mast is secured to a thwart, or a flag-staff to the stern of a vessel.

Togs. An old name for clothes among sailors. *Sunday togs* are best clothes, and *long togs* are those worn by people on shore. An officer *togged to the nines* is in full dress.

Toke. A drink made from honey on the island of Madagascar.

Toko for Yam. An expression used by the negroes of the West India Islands, meaning to cry out before being hurt.

Tom Astoner. A gay, dashing fellow.

Tomcod. The fish *Morrhua pruinosa*, which is found on the coast of America at the time of frosts; hence called *frost-fish.*

Tom Cox's Traverse signifies the efforts made by a skulker to avoid work. It has been described by "Up one hatchway and down another;" also, "Three turns around the long-boat and a pull at the scuttle." But the traverse is not limited to these descriptions.

Tomnoddy, or Tomnorry. A fish; the *Fratercula artica.*

Tom Pepper. The name for a liar.

Tompion. A wooden plug placed in the muzzle of a gun to keep out water and dust.

Tom-tom. A rude drum used by the natives in tropical countries.

Ton. 20 hundred-weight, or 2240 pounds. A short ton of 2000 pounds is frequently used. A ton in space is estimated at about 40 cubic feet. *Ton for ton and man for man*, an expression meaning that all the vessels of a fleet should share, according to tonnage and number of crew, in the prizes taken.

Tonee. A canoe formerly used on the coast of Malabar.

Tongs, Shot-. An iron instrument used in hoisting or lowering shot from one deck to another.

Tongue. A low point of land. Also, a mass of ice projecting under water from an iceberg. The name is also applied to the long tapered end of a piece of timber which is joined to another piece by scarfing. *Tongue of a bevel*, the movable part of a beveling instrument.

Tonnage. The contents or burden of a ship in tons, which is commonly calculated by builders and merchants by a curious rule, given hereafter, producing what is called the builder's tonnage. The real burden a ship is to carry when brought down to the load water-line can be ascertained by the use of one of the several rules in use for finding the displacement of a ship and the making of a scale of displacement therefrom.

The rule established by law in the United States under act of 1799, and which continued in force until superseded by that given in the law of May 6, 1864, provided that from the extreme length of the vessel there should be deducted three-fifths of the breadth; the remainder was multiplied by the breadth and the product by the depth, which in the case of a double-decked vessel was arbitrarily assumed as being equal to one-half the breadth; the latter product was then divided by 95, and the quotient was taken as the legal tonnage on which tonnage dues were to be paid. It was thus made the interest of owners to build excessively deep ships, the law in this way discriminating in favor of

clumsy, slow, and inefficient ships, and discouraging attempts at improvements in model.

By the act of May 6, 1864, vessels are divided into six classes according to length, those in each class being divided into a certain number of equal parts or transverse sections, to which different values are assigned in computing the total tonnage of the vessel; the actual depths between decks are measured and taken as factors, and any closed-in space on or above the upper deck and capable of receiving cargo, etc., is included in the measurement.

The dimensions are all taken in feet and decimals of a foot, and the number 100 is used as the final divisor for ascertaining the capacity of the ship in tons, instead of 95, as in the old law.

Class 1. Vessels under 50 feet long, divided into 6 equal parts.

Class 2. Vessels 50 to 100 feet long, divided into 8 equal parts.

Class 3. Vessels 100 to 150 feet long, divided into 10 equal parts.

Class 4. Vessels 150 to 200 feet long, divided into 12 equal parts.

Class 5. Vessels 200 to 250 feet long, divided into 14 equal parts.

Class 6. Vessels over 250 feet long, divided into 16 equal parts.

The details for making the measurements and calculations are too long to be inserted here, but may be found in "Revised Statutes of the United States," Section 4153.

The rule adopted in England by the Merchant Shipping Act of 1854 is essentially the same as that established in this country: the measurements are made in feet and decimals, and the principles of calculation are identical. Vessels are divided as follows:

Not exceeding 50 feet in length, into 4 parts.
Not exceeding 120 feet in length, into 6 parts.
Not exceeding 180 feet in length, into 8 parts.
Not exceeding 225 feet in length, into 10 parts.
Over 225 feet in length, into 12 parts.

In steam-vessels the length, breadth, and height of the engine-room are multiplied together, the product divided by 100, and the result deducted from the gross tonnage. The space occupied by the propeller-shaft is considered as a part of the engine-room.

It would seem that the American method, employing, as it does, a greater number of divisions for the same length, should be slightly more accurate than the English, or afford at least, on the average, a somewhat nearer approximation to the true capacity of a vessel; either, however, may be relied on generally as coming within 4 or 5 per cent. of the truth. This difference may, in extreme cases, amount to 10 or 12 per cent., a trifling error as compared with those incident to the old system.

The ton measurement upon which freight is charged is calculated at 40 cubic feet; the difference between that and the ton of 100 cubic feet, or that of the register, represents the dead weight or displacement of the ship when light, or 60 per cent. of the whole, 40 per cent. only being available flotative power for cargo.

Top. A platform of semicircular form resting upon the trestle-trees of the lower mast of a square-rigged vessel. It gives spread to the topmast rigging, which is set up to the rim of the top. It also serves as a place for sharp-shooters during an engagement, and in a large vessel is of sufficient size for the use of a howitzer. It is of use as a landing-place from which the light-yard men start in loosing or furling, as a place where topgallant and royal studding-sails are kept at sea, and from which they are set, and where men are stationed to set or take in royals, and light studding-sails when the gear is brought into the top instead of to the deck. The top is supported on the under side by the futtock-shrouds, which extend from the rim on each side to a band on the lower-mast below the cheeks. The breadth of a main-top is equal to one-half the molded breadth of beam, and its length is five-eighths of its breadth. The size of a fore-top is nine-tenths that of the main-top, and the size of a mizzen-top is five-sevenths that of the main-top. *To top a boom*, to raise the outer end by means of the topping-lift. *To top the glim*, to snuff a candle. *To top the officer*, to take upon one's self airs of superiority.

TOP-ARMINGS. Hammocks stowed in the tops to serve as a protection for small-arm men during action.

TOP-BLOCK. A heavy iron-strapped block through which the top-pendant reeves in sending a topmast up or down.

TOP-BURTON. See TACKLES.

TOP-CASTLE. A protected place at the mast-heads of ships built in the early days of the English navy, from which darts and arrows could be thrown upon the enemy's deck.

TOP-CHAIN. A chain used as an additional support for a topsail-yard in case of injury, during action, to the ropes by which it is held in position.

TOP-LIGHT. A large lantern carried in the mizzen-top of a flag-ship at night.

TOP-LINING. A lining-cloth sewed to the after side of a topsail to protect it from chafing against the rim of the top.

TOPMAN. A man stationed for duty in one of the tops.

TOP-MAUL. A heavy hammer, resembling a sledge.

TOP-NETTING. A netting fastened to the rail and stanchions at the after rim of a top.

TOP-PENDANT. A large rope used in sending a topmast up or down. It passes through the top-block at the lower-mast head, then through the sheave-hole near the heel of the topmast, and secures at the head of the lower-mast. It is of sufficient length to allow the heel of the topmast to reach the deck.

TOP-RAIL. A light iron railing, placed at the after rim of a top.

TOP-RIM. The circular sweep which forms the edge of a top.

TOP-ROPE. See TOP-PENDANT.

TOP-SWIVEL. A small gun formerly used in a ship's top.

TOP-TACKLE. See TACKLE.

Top-and-butt. A method of working planking, causing every other seam to present a fair edge.

Tope. A species of shark. Also, the name of a small Chinese junk.

Topgallant. The name applied to the mast, sail, yard, and the ropes belonging to each which are next above the topmast and topsail. It is also applied to portions of the deck or rail raised above the rest.

Topgallant-forecastle. A short deck in the bow of a vessel above the spar deck. In ships of war it is of sufficient size for the working of a gun as large as a 60-pounder, and a part of the crew can be berthed underneath. The cables are also worked under the topgallant-forecastle in sloops-of-war and merchant vessels.

Topgallant-mast. The mast above the topmast. The topgallant-mast and royal-mast are usually made from a single spar.

Topgallant-rail, or Bulwarks. A light rail or bulwarks built upon the main bulwarks of a vessel.

Topgallant-sail. The sail next above a topsail.

Topgallant-yard. See Yard.

Top-hamper. Unnecessary spars and rigging kept aloft.

Top-knot. A species of flat-fish of the genus *Rhombus* (*R. punctatus*).

Topmast. The mast next above the lower-mast. See Masts.

Topsail. See Sails.

Topsail Schooner. A schooner which carries a square topsail on her fore-topmast. When sailing before the wind a square-sail can then be set upon the lower yard. A schooner which has a square topsail upon both fore- and main-topmasts is called a *two-topsail schooner*.

Topsail-sheet Bitt. A bitt or timber-head near the lower-mast, through which a topsail-sheet is rove, and to which it is belayed.

Topsail-yard. See Yard.

Top-sawyer. One who takes the leading part in any work.

Top-sides. The upper part of the ship, including all above the water-line.

Top-side Lines. The general outlines of the top-sides, either forward and aft, or vertically.

Top-timbers. The uppermost timbers composing the frame of a ship.

Top-timber Line, or Top-breadth. The curve limiting the height of the sheer at the head of the top-timbers.

Tor (Ang.-Sax. *torr*). A high peak or rock.

Tormenter. A large iron fork with two prongs, used by the ship's cook in taking meat from the coppers.

Tornado. A tempest distinguished by its revolving as well as progressive motion. See Storm, Revolving.

Torpedo. A species of ray (*Torpedo vulgaris*) having electric power. It is found in the Mediterranean and Atlantic. It is also called *cramp-fish*.

Torpedo. This term is properly applied to a torpedo used in attack only, those used for defensive warfare being called *submarine mines*.

Capt. David Bushnell, of Connecticut, was the originator of the idea of torpedo warfare; but Robert Fulton first called a magazine of powder intended for use under water a torpedo. Bushnell carried on his experiments before the Revolution, and made some unsuccessful attempts during that war to blow up the enemy's vessels. Fulton's experiments, carried on abroad and afterwards in the United States, came to an end previous to the war of 1812. The non-success of torpedoes during that war, and the general feeling against this mode of warfare, as inhuman and barbarous, caused all experiments to cease for many years. Both these inventors thought it necessary to construct and use submarine boats for this kind of warfare. The difficulties met with in the attempted solution of this problem, together with the want of steam as a motive-power, and the necessity of using clock-work to explode their torpedoes, caused almost all their efforts to prove abortive. No further experiments of importance with movable torpedoes for offensive warfare were made until the civil war of 1861–65. During the summer of 1863 they were first brought into general use. The torpedoes employed by the rebels were of various forms and sizes. They were usually made of stout copper, although torpedoes made of barrels and other vessels were occasionally extemporized; they contained from 50 to 150 pounds of powder, according to circumstances. Every description of vessel in their service was fitted with torpedoes, generally a spar attached to the vessel by a goose-neck and controlled by guys and tackles was used. They also constructed boats especially for torpedo warfare; these boats were generally known as davids, from their small size. The fuzes fitted to the torpedoes were generally of the percussion type, so as to explode on contact.

The complete destruction of the sloop-of-war "Housatonic," February, 1864, was by a torpedo fitted with such a fuze, carried by a submarine boat. The "Minnesota" was considerably damaged by a torpedo containing 53 pounds of powder carried on the end of a spar from an ordinary steam-launch. The various attacks made at other times as a rule did but little damage. The destruction of the "Albemarle" by Lieut. Cushing was accomplished by a torpedo consisting of a copper cylindrical case filled with powder, through the centre of which there was a hollow tube; at the bottom of this tube was a large fulminate cap; a small-sized grape-shot was held at the upper end of this tube by a pin.

The torpedo was exploded by pulling a line connected to the pin, which being withdrawn allowed the grape-shot to run down the hollow tube inside the torpedo and explode the fulminate cap.

The rebels were very successful in blowing up vessels by torpedoes planted in their rivers and harbors, but, according to the division already spoken of, these come under the title *submarine mines*.

Drifting torpedoes were also used, but with indifferent success, on account of their primitive form.

They were but little better than those used by Bushnell, at Philadelphia, in 1777, which caused the panic and engagement known as "the Battle of the Kegs." This kind of torpedo might be used with advantage against pontoon bridges, booms, etc., and several kinds have been devised for this purpose. In fact, the first torpedoes used were of this nature. They are frequently fired by the revolution of a paddle-wheel, or other action of the current upon the torpedo after it has brought up against the obstruction; the current having no effect while the torpedo is drifting with it.

Another kind of torpedo is known as the Otter, or towing-torpedo. These can be fired either by contact or electricity. Considerable interest was manifested a few years since in the "Harvey towing-torpedo." This torpedo was towed on the quarter of the attacking vessel,

which by passing or other means was supposed to bring the torpedo in contact with the vessel to be destroyed. While in theory it was rather plausible, in practice it was not successful.

There are some other types of towing-torpedoes, but none are much superior to the Harvey.

Those torpedoes which possess within themselves the power to move through the water are sometimes called locomotive-torpedoes; to this class belong the Whitehead fish-torpedo, the Lay torpedo, and Rocket torpedoes.

The Whitehead torpedo is cigar-shaped, being largest at the middle and tapering to each end. It is divided into three compartments; the forward compartment carries the charge, the middle section carries the adjustment mechanism, in which lies the secret of the invention, and the after part contains the air- and engine-chamber. It is driven by compressed air, the engines being able to exert a force of 40 indicated horse-power, and weighs but 35 pounds. The torpedoes vary in size from 14 to 19 feet in length, and from 14 to 16 inches in diameter, and have a speed varying from 10 to 20 knots an hour for the distance of 1000 yards. It is fired mechanically, either upon contact or after having run to any desired distance. It can be adjusted so as to run any depth from surface from 5 to 15 feet. In still water without currents it will travel in a straight line. It can be adjusted to stop after having run any distance up to its extreme range, and after stopping to sink, float, or explode. The torpedo can be projected from tubes under water either right ahead or on the broadside. It can also be projected from the surface. The first time this torpedo was used in actual service was in the engagement between the "Shah" and "Huascar," when it completely failed; it was said the distance was too great. The second attempt to use it was by the Russians against the Turks, December, 1877. Two were fired, both missed, and went ashore on the beach. The third and last time by the Russians, January, 1878. Their torpedo-boats undertook to enter the harbor of Batoum to attack the Turkish fleet, but met a Turkish revenue-steamer, at which they discharged their torpedoes and destroyed her. The alarm given caused this to end the attack. The results accomplished so far are not at all commensurate with the money and trouble expended on this torpedo.

The Lay torpedo somewhat resembles the Whitehead torpedo in its general design. Ammoniacal gas supplies the motive-power. The torpedo is connected with the ship or shore by an insulated wire, and carries above-water some visible object. The wire is carried on a reel in the torpedo, and pays out as the torpedo runs its course. By it the torpedo may be started, stopped, steered, fired, sunk, raised, etc. It has been said of this invention that it can do everything but talk. It can be discharged from ships or from the shore, but it is doubtful if such a torpedo would prove manageable in a sea-fight. They are besides very expensive, and the successful handling of them requires a person of experience and ability. However, it would appear to have advantages over the Whitehead torpedo, which is sure to miss the object aimed at when influenced by tides or currents.

Finally, there is the spar-torpedo, which remains a favorite with many of the officers of our navy. This is a great recommendation in its favor, as torpedo warfare originated and has been chiefly developed in this country. Nearly every success with offensive torpedoes has been made by a torpedo carried on the end of a spar projecting from a boat or vessel. They should explode on contact, and by electricity at will. This makes explosion a certainty. Had it been necessary for the late Commander Cushing to explode the torpedo used by him with a Farmer machine, it is probable he would not have destroyed the "Albemarle." The ordinary service fuze is exploded by the electricity heating a fine platinum thread, which makes a bridge within the fuze itself. These fuzes are made very perfectly at the Torpedo Station.

In case of war, the small steam-tugs, yachts, etc., in our harbors would make good torpedo-boats. They could be quickly and cheaply fitted for service. Doubtless it would be better to have a large number of small, very fast boats, especially designed for this purpose, on hand ready for an emergency. In an attack it is probable that many of them would be destroyed, but a successful explosion by one would destroy any ironclad.

The torpedoes used on the "Alarm" are of a shape not unlike an ordinary elongated projectile, having the outboard end hemispherical. Those for the bow spar are 4½ feet long and 1 foot in diameter, and hold 100 pounds of powder. Those for the side spars are not so long. The end of the spar enters the torpedo-shell for about a foot, there is a space then of about 6 inches for water to act as a cushioning, then there is a diaphragm with an opening in centre, for the water-tight fitting fuze. The wires are brought up within the spar, and are connected with the key-boards. The torpedoes are fired by a Farmer dynamo-electric machine run by a small steam-engine. The spars run out under water by steam-power, and work satisfactorily. The torpedoes are of the same diameter as the spar, and are put on before the spar is run out. See SUBMARINE MINES.—*R. M. G. Brown, Lieutenant U.S.N.*

Torpedo-boat. The torpedo-boat proper is a very light fast boat, carrying no stores and only a few men. They are only used for harbor-work, unless carried at the davits of larger vessels and lowered in action at sea. The term, however, has frequently been applied in a much more general sense, so as to include vessels of several hundred tons displacement, and also such torpedoes as the Lay torpedo, which is managed by electricity conveyed through an insulated wire from the shore or ship.

David Bushnell, of Connecticut, was the first to call attention to torpedoes and torpedo-boats. He designed a submarine torpedo-boat during the latter part of the last century. His boat carried but one man, and held enough air to allow him to remain below the surface for half an hour. By an ingenious arrangement of oars the operator was enabled to propel and steer his boat. A magazine containing a clock-work was carried on the boat, and by a simple device the operator was to fasten a wood screw into the bottom of the enemy's vessel, which screw was connected by a line to the magazine of powder. The screw having been fastened into the vessel's bottom, the magazine and clock-work were to be detached from the boat and left hanging to the screw,

after which the boat was immediately to retreat. He made various unsuccessful attempts to destroy the enemy's vessels during the Revolution. Washington furnished him with means to carry on his operations, as also did the province of Connecticut. It is no wonder he failed, as the experience of a century has not produced a successful submarine torpedo-boat.

Robert Fulton next became enthusiastic on the subject; he also tried to introduce a submarine boat for torpedo warfare, but after many attempts in France, England, and the United States, was finally forced to give up the plan. He, however, met with some success in blowing up vessels with submarine mines. His experiments came to an end just previous to the war of 1812. During that war some ineffectual attempts by different parties to destroy British vessels further lessened the low estimation held of this method of warfare. Although Col. Samuel Colt successfully experimented with submarine mines, fired by electricity, about the year 1840, no advancement in the science of offensive torpedo warfare was made until the civil war. The rebels having been somewhat successful with submarine mines in 1862, commenced offensive operations the following year with torpedo-boats,—in fact, all kind of vessels were fitted with torpedoes. Several boats were constructed at Charleston, S. C. As a rule they were cigar-shaped, nearly submerged, and carried only 4 or 5 men. They could steam 6 or 7 knots, and were intended for use in smooth water only. One of these boats made an unsuccessful attempt on the ironclad "New Ironsides" in October, 1863. In the following February, in the same harbor, the sloop-of-war "Housatonic" was destroyed by a submarine boat. This boat, however, carried 9 men, and was propelled by a screw worked by 8 of them. She could be submerged at pleasure to any desired depth, or could be propelled on the surface. She was built of boiler-iron, and was 35 feet long. Her greatest speed was about 4 knots an hour in smooth water. She was carried down with the sloop, but was raised after the war, the 9 men being found in her. Several unsuccessful attempts were soon after made upon other vessels of the blockading fleet. Torpedo-boats obtained such a reputation that they were greatly dreaded. An attack upon the flag-ship "Minnesota," at Newport News, April 9, 1864, did considerable damage, but did not sink the frigate. The boat used on this occasion was an ordinary steam-launch decked over with boiler-iron, and filled with a spar-torpedo carrying 53 pounds of powder. The destruction of the "Albemarle" by Lieut. Cushing, in October, 1864, was the only occasion during the war in which a torpedo-boat was successfully used by the Federal navy. This boat was designed by Chief Engineer Wood, U. S. navy, and Mr. J. L. Lay. It was an ordinary steam-launch, armed with a torpedo. The torpedo was rigged out ahead of the launch on the end of a spar, and was fired by pulling a laniard, which allowed a small grape-shot to roll down against a fulminate cap. The same parties afterwards designed the "Spuyten Dyvil," a very complete torpedo-boat of 200 tons displacement, but the termination of the war prevented a thorough test of efficiency.

In England, of late years, much attention has been paid to the construction of very fast light boats for torpedo warfare. Messrs. Thornycroft & Co. and Messrs. Yarrow & Co. are the best-known firms engaged in this business. The boats they construct are generally of steel, covered over with a light deck. They, generally speaking, are from 50 feet to 90 feet in length. Some are intended to be carried at sea on large vessels, being hoisted in and out as necessary. Messrs. Thornycroft have also an arrangement by which these boats can carry and use the Whitehead fish-torpedo. The spar-torpedo has been used very successfully with these boats.

Messrs. Herreshoff, of Rhode Island, have constructed a large number of very light fast boats fitted with the Herreshoff boilers. The propeller is under the centre of the boat, and they are fitted with a large balance-rudder. They are constructed for use on smooth water only.

Capt. Ericsson has recently constructed a torpedo-boat, the "Destroyer"; she is 130 feet long, 11 feet deep, and 12 feet beam. Her speed, though good, has not as yet been entirely satisfactory. The torpedoes were to be discharged from a tube under water, by compressed air or other agent, but as yet the plan has not proved a practical success.

The "Alarm," a torpedo-ram, was built from plans designed by Admiral Porter, U.S.N. Her total length, including a ram 30 feet long, is 173 feet, beam 28, and 13 feet depth of hold below spar-deck. She is built on the transverse bracket system, with a double bottom. She has a tonnage of 311 tons within the inner skin, and a displacement of 720 tons. She was originally fitted with the Fowler wheel, an invention which enabled the whole energy of the main or driving-engines to be instantly diverted for steering purposes, and then instantly restored for driving purposes. This handiness was, however, at the expense of speed. She is now being fitted with the Mallory propeller, by which it is hoped she will have the same handiness and, at the same time, the speed of the ordinary propeller. She is protected by 4½ inches of armor on the bows, and designed to fight bows-on at all times. This thickness of armor is thought to be sufficient to cause the heaviest projectile to glance when fired from directly ahead.

There is a 15-inch smooth-bore gun on the bows, and she carries a number of Gatling-guns on the rail. The system of torpedo-spars run out under water by steam-power, one ahead 30 feet, and one on each side 18 feet. The torpedoes are fitted to the end of the spars before running them out. They are fired by electricity, as is also the gun. Should the Mallory propeller prove successful, she will be one of the most formidable vessels in the world, and of a type very suitable for the protection of our coast.

The "Polyphemus," now under construction in England, bears a considerable resemblance to the "Alarm," being a torpedo-ram, but carrying no gun. She is to have a turtle-back armor, and is to be fitted for discharging Whitehead torpedoes. Length, 240 feet; beam, 40 feet; and draft, 20 feet. A speed of 17 knots over the measured mile is anticipated.

The efficiency of the Whitehead torpedo for actual war is by no means settled: it has failed twice to where it has succeeded once. Nearly every success with offensive torpedoes has been accomplished by the spar-torpedo.

The great expense and delicate handling required in manipulating the Lay torpedo will probably prevent its general use; yet, if properly handled, it may prove to be extremely valuable for harbor use. The ease with which it can be turned, stopped, fired, etc., is very wonderful.

As submarine boats have apparently been given up, it is probable that for harbor defense there is nothing cheaper and surer than light boats with the spar-torpedo. These would also be useful at sea if carried by large vessels and lowered in action.

For coast defense, torpedo-rams of the general principle of the "Alarm" would seem to be the best. When torpedoes can be discharged from guns or tubes under water, torpedo-ships for cruising upon the high seas will doubtless come into favor.—*R. M. G. Brown, Lieutenant U.S.N.*

Torpedo Station. The civil war first brought torpedo warfare into prominent notice. In order that the naval service should be thoroughly informed on this subject, Admiral Porter conceived the idea of establishing a torpedo school, where the officers of the service could be instructed in the manufacture and use of torpedoes. In this he was ably seconded by the chief of the Bureau of Ordnance, Rear-Admiral Case, whose zeal and ability brought the torpedo school up to its present standard. Commander Matthews was selected as a suitable officer to found the institution. Accordingly, he was ordered on June 9, 1869, to duty under the Bureau of Ordnance as instructor of the torpedo corps of the navy. During the following summer he was ordered to select a suitable place for the headquarters of the torpedo corps. As it would have required an act of Congress and the consent of the Legislature of the State to obtain possession of any land for this purpose, it was desirable to find a suitable site upon land already owned by the general government. It was finally resolved to establish the station on Goat Island, in the harbor of Newport, R. I., that island being transferred, in accordance with arrangements made by Rear-Admiral Case, from the War to the Navy Department. In the following September Commander Matthews took possession, and commenced building the necessary shops, etc. An old frame house was converted into a temporary machine-shop, and a laboratory and magazine were erected. During the winter the old barracks, now the commanding officer's quarters, were converted into offices and a manufacturing laboratory. In the spring of 1870 the "Nina" was ordered to the station, the crew being for general use connected with the station. Several officers had by this time been ordered to duty under Commander Matthews, and a competent chemist was appointed to take charge of the laboratory. During the summer of 1870 the north end of the old barracks was fitted up for quarters for the commanding officer, who soon after took up his residence on the island, about the same time the nitroglycerine manufactory was established. During the summer of 1871 three cottages were built for officers' quarters, and the following summer two more were constructed, completing the present row. In the fall of 1872 the machine-shop was commenced. This important building was finished the following spring. Professor Farmer, an experienced electrician, was secured as a permanent instructor in 1872. The first class of officers ordered for instruction reported November 1, 1870, and consisted of 19 members. They remained until April, 1871.

The difficulty of getting officers of rank and experience to again resume the tasks and recitations of their school-days was very considerable, but the zeal and patience of the commanding officer was finally rewarded by success. A second class was ordered June 1, and remained until January 13, 1872. The third class succeeding this one remained until August 1, 1872. It was now found that the instructors needed more rest, and accordingly the class ordered September 1 remained until the following July (1873), when there was a vacation until September 1, at which time the succeeding class reported. Considerable trouble was caused by the dislike of the officers to the manual labor necessary in fitting, laying out, and firing the torpedoes, as no men were allowed to assist in this work. However, this also was overcome, and officers of rank could be seen daily with aprons on, experimenting with chemicals, or carrying powder and fitting torpedoes. All the work was done by the officers themselves, even to pulling the boats and transporting the torpedoes.

Commander Matthews was relieved by Capt. Simpson on July 1, 1873. During the summer of 1874 a new building for electrical purposes was erected, a change was also made in regard to the time the classes should attend. The officers that year were ordered to report July 1, and were at the school only four months, the practical part of fitting and firing the torpedoes being particularly taught. This has been the custom since that time, but the course of study has been much elaborated.

Capt. Simpson was relieved in June, 1875, by Capt. K. R. Breese, who was relieved by Capt. Ramsey, the present commanding officer, in 1878.

The course of instruction embraces chemistry, electricity, and physics, with an additional course of instruction in the practical manufacture of explosives, including nitro-glycerine, dynamite, gun-cotton, and various fulminates used in torpedo warfare. Instruction is given in the practical making of fuzes and the testing and firing of them. Each officer is obliged to fit torpedoes, plant and fire them. At the end of every term a board of experienced officers is ordered to witness the examination of the officers under instruction, and report to the Department the condition of the institution.

The torpedo station undoubtedly accomplishes the object desired by its founder, and the service and country are indebted to the officers who by their zeal and energy made the experiment a success.—*R. M. G. Brown, Lieutenant U.S.N.*

Torquay, a favorite watering-place of England, Devon County, is picturesquely seated on the shore of a cove of Torbay. It consists chiefly of handsome villas and terraces. It has a good harbor, some timber trade, a share in the Newfoundland fishery, regular steam communication with Portsmouth and Plymouth, and well-supplied markets. Pop. 21,657.

Torrent. A stream of water in mountainous districts, swollen by rains or melting snow.

Torse. A coarse kind of hemp used in the manufacture of an inferior quality of cordage.

Torsk. See Tusk.

Tort. A term in law for a wrong or injury.

Tortue de Mer (*Fr.*). A sea-turtle. The term is also applied to a French store-ship or transport.

Tosh (*Eng.*). A cant word, meaning to steal copper from a vessel's bottom.

Toss the Oars. To take the oars from the rowlocks and bring them to a perpendicular position, with the ends resting in the bottom of the boat. Oars are tossed in this manner as a salute from a boat containing an officer below the rank of a commanding officer, to a boat containing an admiral, vice-admiral, rear-admiral, or commodore. When a boat goes alongside a vessel or a wharf, the oars are tossed and laid into the boat at the order given by the stroke-oarsman.

Toss up the Bunt. To roll the bunt of a sail on to the top of the yard.

Tot. A drinking-cup holding a little less than half a pint, in which the spirit ration was served out. The difference between this measure and the half-pint was the share of the mess-cook.

Toucan. See Constellation.

Touch. The broadest part of a plank worked top-and-butt, which place is 6 feet from the butt end. The sudden angles in the stern timbers. *Touch-and-go*, a term descriptive of any narrow escape. *Touch-and-take*, an expression of Nelson's applied to a vessel about to engage the enemy. *To touch at*, to stop at a port for a short time, being on a passage between two other ports. *To touch the sails*, to cause the weather leeches of sails to shake by sailing too near the wind. *To touch up a sail*, to mend the furl of a sail, or make it more snug on the yard.

Touch-box. The box in which lighted tinder was formerly carried by soldiers armed with match-locks.

Touch-hole. A common name given to the vent of a gun.

Touch-wood. Decayed wood or punk, used for producing fire from a spark.

Toulon. A seaport city and naval station of France, admirably situated at the bottom of a deep double bay formed by the Mediterranean. Lat. 43° 7′ N.; lon. 5° 56′ E. In front of the bay is a projecting tongue of land, which nearly closes its entrance, and along it, as well as the adjacent points, numerous forts have been erected. In like manner, on the land side, the fortifications are of the most complete description. The arsenal and other marine establishments are on a scale of almost unrivaled magnificence. The port is separated from the roadstead by moles, which are hollow and bomb-proof, and lined by batteries *à-fleur-d'eau*. There are two ports, the eastern one appropriated to merchant vessels, and called the Port-Marchand, and the Port-Militaire, where are immense magazines, arsenals, ship-building docks, rope- and sail-works, and the convict prison. It is the seat of a maritime prefecture, and possesses a school of hydrography, naval medical school, etc. Pop. 71,000.

Tourniquet. A bandage with a screw attached which, when applied to a wounded limb, stops the flow of blood by external pressure.

Tourville, Aimé-Hilarion de Cotentin, Comte de, an illustrious French seaman, was born at the chateau of Tourville, in Normandy, in 1642, and died in Paris in 1701.

Tourville entered the Order of Malta at 14, and at the age of 18 began to serve in the galleys of the order. Some jealous contemporaries ridiculed him for embracing the profession of arms, and spitefully represented him as an Adonis, more fitted to serve among court ladies than to endure the fatigues of the sea-service. Tourville, however, early made such a reputation in his cruises against the Moors that Louis XIV. sent for him to court, and gave him the grade of *capitaine de vaisseau*.

In 1669 the young captain served, under the Duke de Beaufort, at the relief of Candia, then besieged by the Turks, and further distinguished himself, in 1671–73, in the war with Holland. In 1675 he commanded one of the fleet sent to the relief of Messina, which city had revolted against the Spanish rule.

The following year he was made *chef d'escadron*, and took part in the brilliant expedition of the celebrated Duquesne against the Algerines and Tripolitans, when the corsairs received the most crushing blows which had ever been dealt to them up to that time. He was particularly conspicuous in the bombardment of Algiers.

In 1684 he participated in the bombardment of Genoa, and, four years after, in the expedition against Holland, during which he captured two Dutch men-of-war. Again, in the August of the same year, he nearly ruined the city of Algiers by bombardment.

In 1689 he received the title of Admiral of the Levantine Seas, in which, however, he was destined never to serve, but was immediately put in command of a fleet of 20 vessels, which, in connection with a fleet under D'Estrées, was to support the cause of James II. This combined fleet succeeded, in spite of the exertions of the English, in landing in Ireland a considerable amount of munitions of war and some men.

While in command of the fleet, in July of the year following he encountered an Anglo-Dutch fleet in the Channel, off the Isle of Wight, and in the engagement which ensued he captured 10 vessels and burnt 5, while the French did not lose a single ship. Soon after this success he appeared off Teignmouth, where he destroyed a number of vessels and carried off the valuable cargoes of others.

In May, 1692, Tourville was ordered by Louis XIV., for political reasons not necessary to be detailed here, to sail from Brest to meet the Anglo-Dutch fleet, which consisted of 88 vessels of all rates. Tourville had only about half that number, and remonstrated at being forced to an engagement without reinforcements. He was again ordered to fight the enemy, *fort ou faible*, against any odds. The hostile fleets met just off Cape La Hogue on May 19, 1692, Tourville leading the attack in his flag-ship, the "Soleil Royal," of 106 guns. The engagement was most obstinate; the opposing fleets renewing the fighting for three days. On the 22d Tourville's fleet was completely beaten, but no prizes were made by the allies. The French historians insist that if the minister of marine, Pontchartrain, and his royal master had been willing to wait for the fleet from Toulon, which had been delayed by head-winds, the victory would have been on the side of Tourville.

In 1693 Tourville was made a marshal of France, and the same year fought an action with the Anglo-Dutch fleet off Cape St. Vincent,

in which there were heavy losses and very little decisive gain on either side.

After the peace of Ryswick (1697) Tourville's health failed, and he was obliged to give up active service.

The French navy owed much to Tourville, in morale, organization, and tactics. Saint Simon says he was thoroughly conversant with every duty of the marine service, from that of carpenter to admiral. His justice, coolness, gentleness of manner and politeness to every one; his foresight, prudence, and distinguished courage, led all the young men of the navy to endeavor to serve under him. He was noted for the clearness and decision of his orders, and established an excellent code of naval signals.

The French generally have a man-of-war named after this distinguished sailor.

Tourville had one son, who became a colonel in the army, and was killed at the battle of Denain while still quite a youth.—*E. Shippen.*

Touter (*Eng.*). A slang name for a revenue-cutter. Also applied to an officer of customs.

Tow. To draw a vessel or boat through the water by means of a rope attached to it. An article is *towed overboard* from a vessel by attaching a rope and dragging it through the water. *A tow*, the vessel towed.

TOWAGE. Charges paid for services rendered by a tow-boat.

TOWING-BRIDLE. A heavy chain or hawser to the bight of which a tow-line is attached, when one vessel is being towed by another.

TOWING-HOOK. A large hook sometimes fastened to a towing-bridle, to which the tow-line is attached.

TOWING-PATH, or TOW-PATH. The track on the side of a canal for horses engaged in towing.

TOWING-POST. The timber-head on a tow-boat, to which a hawser is secured in towing.

TOW-LINE. A small hawser used for towing purposes.

Towel. A term in English maritime law, supposed by some to have been derived from the expression "Oster la touaille" in the laws of Oleron.

Malloy writes: "If a mariner shall commit a fault, and the master shall lift up the towel three times before any mariner, and he shall not submit, the master at the next place of land may discharge him."

Toxotes. A genus of acanthopterygious fishes, of which the only species known, *T. jaculator*, is remarkable for its power of spurting water so as to bring down insects from aquatic plants within its reach.

T-plate. A plate of metal cut in the form of the letter T, used for securing different pieces of material together by being bolted or riveted thereto.

Trabaccolo. A coaster of the Adriatic.

Trabaleo. An ancient coasting-vessel.

Trabaria. An ancient name for a small canoe.

Track. The path of a vessel. Also, to tow a boat on a canal by means of men or horses. *Tracks for field-carriage*, wooden tracks placed in a launch or other boat carrying a howitzer, upon which the field-carriage is transported from one end of the boat to the other, as may be required. The *landing-skids* are tracks extending from the bow of the boat to the shore, upon which the howitzer is landed or embarked, when mounted on a field-carriage.

TRACK-BOAT. A boat on a canal moved by towing or tracking.

TRACK-CHART. A chart on a small scale showing the path of a ship during a voyage or cruise.

Trade. The exportation and importation of goods or merchandise. A vessel sailing regularly between the United States and China is said to be employed in the China trade, etc. She may also be said to be in the foreign or the coastwise trade.

TRADER. A vessel which makes regular voyages between certain ports for the purpose of trade or barter.

TRADE-WINDS. The name given to the atmospheric currents of the northern and southern hemispheres, which have a general direction from the northeast in north latitude, and from the southeast in south latitude. They are caused by the combined action of the earth's revolution upon its axis, and the cold air of the polar regions moving toward the equator to take the place of the heated and rarefied air which rises from that portion of the earth's surface.

The direction, force, and regularity of these winds are greatly influenced by the amount of land in the two hemispheres, its character, formation, etc. On account of the excess of land-surface in the northern hemisphere over the southern, the average breadth of the belt of northeast trade-winds is estimated at 9° less than that of the southeast trade-winds. The limits of these winds also vary with the declination of the sun, so that with a high southern declination the northeast trades may extend 1° or 2° south of the equator, while with a high northern declination the southeast trade-winds are found to extend 4° or 5° north of the equator. Between these two winds a region of calms, called doldrums, extends through an average breadth of about 6° of latitude. The proximity of land affects these winds, examples of which are seen on the western coast of Africa, where for nearly 100 miles from the coast the prevailing winds are from the west; and on the western coast of South America, where, on account of the height of the Andes, the trade-winds are not encountered until at a distance of about 400 miles from land.

At the commencement of these winds in both hemispheres, when not under the direct influence of land, their direction is more from the east, and changes toward the north and south as the equator is approached. The average direction of the northeast trade-winds is from E.N.E., while that of the southeast trade-winds is from S.E. by E.

Trail. The *trail* of a field-carriage is that part which projects to the rear of the piece.

TRAIL-BAR. The wooden bar which fits into the socket in the end of the trail of a howitzer-carriage, by which the piece is pointed laterally.

TRAIL-ROPE. A rope attached to the trail of a field-carriage by which it is drawn. Short wooden bars placed through the lay of the rope serve as handles for the howitzer's crew.

Trail-board. A term for the carved work between the cheeks of the cutwater.

Training-level (*Eng.*). A level sometimes used in estimating the elevation or depression of a gun.

Training-pendulum (*Eng.*). An instrument having a pendulum and a level attached, used in pointing guns.

Train-tackle. See TACKLE.

Trajectory. The curve described by a projectile in its flight.

Trammel. A large net.

Tramontana. Literally, from beyond the mountain. The word is applied in Italy to the north wind, blowing from the Alps.

Tran. A Norwegian word for *fish-oil.*

Trankeh. A vessel or large boat of the Persian Gulf.

Transfer. To change officers or men from one vessel to another.

Transire (*Eng.*). A custom-house document issued to a coasting-vessel.

Transit. The passage of a heavenly body across the meridian of the observer. The passage of a heavenly body, or of its shadow, across the disk of a larger body. See ECLIPSE.

TRANSIT INSTRUMENT. A telescope which moves in the plane of the meridian, and therefore adapted for observing the transit of a heavenly body across the meridian.

Transom. One of the horizontal timbers composing the stern-frame. They are secured to the stern-post in the same manner as the floors to the keel; the ends are beveled and trimmed; the fashion pieces are then laid on and bolted to them. The stern-post, transoms, and fashion pieces compose the stern-frame. *Transoms of a gun-carriage*, the parts on the under side of the carriage by which the brackets are connected. They are called the *breast* and *rear* transoms.

TRANSOM-KNEE. A knee bolted to the transom and the frames of the ship, and lying level or in the same direction of the transom. When these knees cross the transom they are called *sleepers.*

Transport. A vessel used for carrying troops or munitions of war. Also, to move or haul a vessel from one part of a harbor to another by the use of hawsers.

TRANSPORTING-BLOCK. A large snatch-block used in transporting a vessel.

TRANSPORTING TRUCKS AND AXLES. Trucks and axles used in moving a gun mounted on a pivot-carriage from one part of the deck to another.

Tranter (*Eng.*). One who sells fish.

Trap-creel (*Eng.*). A basket used in taking lobsters.

Travel. To slip, as a thimble upon a rope. Also, to revolve, as the sheave of a block.

TRAVELER. An iron ring or thimble fitted to slide upon a spar or an iron rod.

TRAVELER-IRON. An iron bar fitted to the deck, upon which the sheet of a fore-and-aft sail travels.

TRAVELING-BACKSTAY. A backstay fitted to a traveler on the topmast, by which the mast is supported at the place to which the topsail-yard is hoisted.

TRAVELING-GUYS. Guys sometimes fitted on small vessels for supporting the jib-boom when the jib is set.

TRAVELING-MARTINGALE. A martingale fitted to the jib-boom of a small vessel, which is in use only when the jib is set. A martingale which was formerly used to support the jib-boom under the jib-tack.

Traverse. The various courses made by a vessel in beating against a head wind, or the irregular track made by a vessel sailing on different courses. A *boat's traverse* is one of the athwart-ship pieces upon which the tracks for a field-carriage are placed. *To traverse a yard*, to place it fore-and-aft.

TRAVERSE-BOARD. A board formerly used in recording the courses made by a ship during a watch. It consisted of a circular piece of board having marked upon it all of the points of the compass, and, upon each point, eight holes bored. The course for each half-hour was noted by placing a peg in one of the holes corresponding to the ship's course.

TRAVERSE-HORSE. See JACKSTAY.

TRAVERSE-QUESTIONS. Cross-examination.

TRAVERSE-SAILING. The case in plane sailing, in which the ship makes several courses in various directions. The solution consists in obtaining an equivalent course and distance from the several courses and distances sailed.

TRAVERSE-TABLE. A table so called from its use in traverse-sailing. It contains the true difference of latitude and departure corresponding to every course (at intervals of a quarter-point and also of degrees) from 0 to a right angle, and every distance up to 300 nautical miles (at intervals of one mile). It is constructed by solving a right-angled triangle, of which one angle represents the course and the hypothenuse the distance; by giving these different and successive values, the corresponding values of the other two sides are found, which sides represent the true difference of latitude and departure.

TRAVERSE-WIND. A wind blowing into a harbor.

Traversier. A small fishing-vessel on the coast of France.

Traversum. The ancient name for a ferry.

Trawl. A line towed by a boat, having at intervals baited hooks attached for catching fish.

TRAWL-BOAT. A boat used in fishing with a trawl.

TRAWL-NET. A small net dragged on the bottom in shoal water for catching fish.

Trayeres. An ancient term for a large boat.

Tread. The whole length of a keel or deck.

Tread Water. To keep the body in a perpendicular position at the surface by treading or walking in the water.

Treble-block. A block containing 3 sheaves.

Trebling. The strengthening planks put on a vessel's bow to withstand the pressure of ice.

Trebuchet. An ancient battering-engine in which stones were used as projectiles.

Treck-schuyt. A Dutch canal-boat.

Treeing. A peculiar appearance of the ice in Arctic regions, caused by refraction, which indicates the proximity of open water.

Treenail. A pin of oak or locust, of a cylindrical form, used as a fastening for plank below the water-line. This kind of fastening is much used in building merchant vessels, but seldom in the naval service.

Trees of a Ship. Chess-trees, cross-trees, and trestle-trees.

Trelawney (*Eng.*). A thin pudding of barley-meal.

Trench the Ballast (*Eng.*). To trim or stow ballast.

Trenchard, Stephen D., Rear-Admiral U.S.N. Born in New York, July 10, 1818. Appointed from New York, October 23, 1834;

receiving-ship, New York, 1835–37; Naval School, Philadelphia, 1839–49.

Promoted to passed midshipman, July 16, 1840; sloop "Preble," West India Squadron, 1841–44; sloop "Fairfield," Home Squadron, 1844–45; coast survey, 1845–49.

Commissioned as lieutenant, February 27, 1847; sloop "Albany," Home Squadron, 1850–52; receiving-ship, Philadelphia, 1853; coast survey, 1854–57; steam-frigate "Powhatan," East India Squadron, 1857–59; commanding steamer "Rhode Island," supply-vessel to Blockading Squadron, 1861–65.

Commissioned as commander, July 16, 1862; two attacks on Fort Fisher, December, 1864, and January, 1865; navy-yard, New York, 1866–69.

Commissioned as captain, July 25, 1866; commanding steam-sloop "Lancaster," flag-ship South Atlantic Squadron, 1869–71.

Commissioned as commodore, May 7, 1871; member Board of Examiners, 1872; light-house inspector, 1873–75.

Commissioned as rear-admiral, August 10, 1875; commanding North Atlantic Station, 1876–78; member of Special Board, 1879–80. Retired July 10, 1880.

Trend. To incline or extend in any direction, as the coast. The *trend* of an anchor is that part of the shank at a distance from the throat equal to the length of one of the arms.

Trennel. See TREENAIL.

Trepang. A name given to the *bêche-de-mer*, used by the Chinese as an article of food.

Trestle-trees. A heavy frame-work of timber placed over the head of a lower-mast and topmast. They rest upon the hounds of the mast, and sustain the weight of the top and cross-trees, and the mast above.

Triangle. A geometrical figure having three sides. Also, small spars lashed together around a mast in the shape of a triangle, used as a stage in painting, scraping, etc.

Triangula. See CONSTELLATION.

Triangulum Australe (*Lat.* "The Southern Triangle"). A constellation half-way between Scorpio and the north pole.

Triatic-stay. A triatic-stay is used in hoisting boats in or out of a vessel. It consists of two large pendants, the upper ends of which are lashed to the foremast and mainmast heads, while to the lower ends, fitted with thimbles, the stay-tackles are hooked. The lower ends of the pendants are held in their proper position by a span.

Tributary. A stream which flows into or supplies another stream.

Trice. To pull up and secure by means of a lashing or *tricing-line*. *Trice up!* the order to raise the heels of the studding-sail-booms before the men lie out on the yards in furling or reefing. A *tricing-line* is any line or rope used to trice up an object with. *In a trice*, in a moment.

Trick. The time which a man remains on duty at the helm.

Trie. An old word, meaning trim.

Triest, the capital of Küstenland and the principal seaport city of Austro-Hungary, is situated on the Gulf of Triest, at the northeast extremity of the Adriatic Sea, in lat. 45° 38′ N., lon. 13° 46′ E. The new part of the town is especially well built. A broad canal, deep enough to float vessels of large burden, runs up from the harbor through this part of the town. Outside of the town is the new lazaretto, one of the best arranged in Europe. The harbor admits vessels of 300 tons to its quays, and vessels of any size anchor safely at a short distance. It is in the form of a crescent, one side of which is formed by the mole, which projects northwest into the sea, and terminates in a broad platform, occupied partly by a fort and partly by an intermittent light 106 feet above the sea. On its north side is a quarantine dock, surrounded with hotels and every other convenience. Close to the harbor are extensive building-docks. Triest is a free port, and possesses a large mercantile navy, and is the headquarters of the Austrian Lloyds, and large numbers of vessels are annually built here. It has an immense import and export trade and extensive manufactories. Population, including suburbs, 110,000.

Trigger. A catch of wood, formerly used in launching, which, upon being struck with a maul, would be displaced and allow the ship to move.

Trigger-finger. The fore-finger of the right hand.

Trig-meat (*Eng.*). Shell-fish.

Trim. To arrange the weights in a vessel in such a manner as to obtain a desired immersion or draft at the bow and stern. Upon this relative draft depends in a great degree the speed of a vessel and the facility with which she can be handled. A vessel is *trimmed by the head* when the draft of water at the bow is greater than at the stern; she is trimmed *by the stern* when the draft at the stern is greatest. Each vessel has a certain trim most favorable to her sea-going qualities.

Ballast and cargo stowed in bulk requires to be *trimmed* or spread from under the hatches into the more inaccessible parts of the hold.

Sails are *trimmed* by changing the position of the yards, in order that the wind may act upon them at the proper angle; also, by hauling the sheets home and hoisting the yards to their proper places, in order that the sails may receive the full force of the wind. A boat is *trimmed* by keeping it in an upright position by means of the crew or cargo. A jacket is said to be *trimmed* when the wearer of it is flogged with a rope's end.

Trink. An old apparatus for catching fish.

Trip. A passage made by a vessel from one port to another. *A round trip* is the whole voyage. An anchor is *a-trip* when it is raised clear of the bottom. *To trip a light yard* is to pull it into a perpendicular by means of the tripping-line, preparatory to lowering it to the deck.

TRIPPING-LINE. A small line attached to the snorter of a topgallant- or royal-yard, reaching to the deck, by which the yard is tripped, the lower lift and brace cleared of the yard-arm, and the yard guided to the deck.

Triple-star. Three stars in such apparent proximity as to resemble a single star.

Tripoli. The capital of the state of Tripoli, on the north coast of Africa. Lat. 32° 53′ 54″ N.; lon. 13° 11′ E. It stands on a rocky promontory washed by the sea on the north and east, and connected with the mainland on the south and west by a sandy plain. It is defended on the land side by a lofty wall flanked with bastions, and on the sea-front by a formidable line of batteries. The trade has the advantage of the only

good harbor for several hundred miles on the coast. It is not over 6 fathoms deep, but has capacity to admit whole fleets of merchant vessels in the outer roads, where there is good anchorage in from 16 to 18 fathoms. About 1000 vessels clear this port annually. Pop. 20,000.

Tripping-valve. A valve for releasing the fluid and relieving the pressure in a hydraulic press or jack.

Trip-shaft. In the steam-engine, a shaft carrying devices for *tripping* or detaching cut-off valves from the main valve-gear in cases where they are actuated, in part, thereby.

Troacher (*Eng.*). One who receives and deals in smuggled goods.

Troite. An obsolete term for the cuttle-fish.

Troll. To fish by drawing the hooks through the water.

Trombone. A name formerly applied to the blunderbuss, from the shape of its muzzle.

Tromp, Martin Van, the celebrated Dutch admiral, was born at Briel in 1597, and died in 1653. When only 11 years old he served on board of a frigate commanded by his father. The latter was killed in an engagement with the French, who took the vessel, and detained the boy on board ship as a *mousse* for three years. When he obtained his liberty he rose rapidly in the Dutch navy, being lieutenant of a line-of-battle ship at 25, and two years later captain of a frigate. A vice-admiral at 40, he commanded a Dutch fleet which, in 1639, totally defeated a Spanish fleet of superior numbers and weight of metal. This success made him very popular at home, and he was also created a noble of France from the date of his victory. In 1652, war breaking out between Holland and England, Van Tromp, in command of the fleet, met Admiral Blake, and in an engagement with him lost 2 line-of-battle ships. Dissatisfied with this result, the States-General caused Van Tromp to be relieved in his command by Van Ruyter. The former was, however, restored to command in a few months; and, on December 10, 1652, defeated the English admiral, driving him into the Thames, and causing great alarm in London. It was then that Van Tromp swept down the Channel with a broom at his mast-head. After this he had many encounters with the English, with varying fortunes, fighting some gallant actions.

At last he was intercepted by Blake near Portland Bill, and badly defeated. In command of a refitted fleet he again had an encounter with the English fleet, under Monk, upon the Dutch coast. In this action he was mortally wounded, but cried out to his crew, "Bear up, my boys. Conduct yourselves so that my death may be as glorious as my life has been!"

The States-General ordered a medal struck in commemoration of Van Tromp, and erected a splendid monument to him at Delft, where he was buried.

Tromp's son, Cornelius, who died in 1691, rose high in the Dutch navy, having attained the rank of vice-admiral. He served principally against the Moorish pirates, and the English and Swedes.

In consequence of a supposed dereliction in duty during the action in the Downs with the English, in July, 1666, Ruyter, under whom he was serving, demanded his dismissal, which was granted; but after two years he was reinstated, and on Ruyter's death succeeded to the command of the Dutch navy. Upon the peace with England, in 1675, he visited that country, and was received most courteously, Charles II. making him a baronet.—*E. Shippen.*

Troop-boat. A boat of great capacity used in the transportation of troops.

Troop-ship. A large ship, either built for the purpose or converted from a frigate or line-of-battle ship, used in carrying troops.

Tropic-bird. The *Phaeton æthereus.* Also called the *boatswain*, on account of the resemblance of its tail to a marling-spike.

Trough of the Sea. The depression of the water between two waves.

Trounce. An obsolete word, meaning to punish.

Trouncer (*Eng.*). An old term for a waister.

Trout. A fresh-water fish of the genus *Salmo*, variegated with spots, and esteemed most delicate food. The brook-trout of America is *Salmo fontinalis*, the lake-trout, *S. confinis.* The *Salmo trutta*, sea-trout, is similar to the salmon in its habits.

Trow (*Eng.*). A boat used on the river Tyne for catching salmon.

Truce. A temporary suspension of hostilities between opposing forces, agreed upon by the commanders for the purpose of negotiation, etc. The desire for such suspension is indicated by showing a white flag, or a *flag of truce*, and the approach of persons under such a flag toward the enemy's lines, or of a vessel to a hostile coast, insures safe conduct among all civilized nations. See FLAG.

Truchman. See TRUGMAN.

Truck. Small articles used in barter. A wheel of a gun-carriage. A circular piece of wood placed on the head of a mast or flag-staff, in which the sheave for the signal-halliards is placed. A fair-leader is called a *leading truck.*

Truckle. The name given on the Welsh coast to the coracle, a kind of boat consisting of a light frame-work covered with leather or oil-cloth.

True-blue. An expression denoting loyalty and sincerity.

True-tide (*Eng.*). A tide which sets in a regular direction.

True Water (*Eng.*). The exact depth of water.

Truff (*Eng.*). A trout.

Trugman. An old term for an interpreter.

Trumpet-fish. A sea-fish; the *Centriscus scolopax;* so called from its tubular muzzle; bellows-fish; snipe-fish.

Trundle-head. The lower drum-head of a double capstan.

Trundle-shot. A projectile formerly used, about a foot and a half in length, pointed at both ends.

Trunk. A small net used in catching lobsters and crabs. Also, a species of turtle.

Trunk-cabin. A cabin half below and half above the level of the spar-deck.

Trunk-engine. A very compact form of steam-engine, in which the connecting-rod is jointed directly to the piston, without the intervention of a piston-rod or cross-head. The rod works within a hollow cylindrical piece, or *trunk*, of sufficient diameter to permit its free oscilla-

tion, which is attached to the piston, and passes from the cylinder through a stuffing-box, acting, also, as a guide. See MARINE STEAM-ENGINE.

Trunk-fish. The *Ostracion*, a fish having a covering of solid bony plates.

Trunnion. One of a pair of cylindrical projections attached to or formed upon the opposite sides of a gun, oscillating steam-engine cylinder, etc., at right angles to its axis, so that the body, when supported thereby in suitable bearings, is free to oscillate about the trunnion axis.

TRUNNION-GAUGE. An instrument used to measure the diameter of the trunnion of a gun.

TRUNNION-LEDGE AND LEVEL. A small shelf attached to the trunnion of a heavy gun, which being placed in a horizontal position by means of a spirit-level, indicates the degrees of elevation or depression.

TRUNNION-RING. A ring formerly placed upon a gun a little forward of the trunnions.

TRUNNION-RULE. A rule used in the inspection of guns for measuring the distance from the trunnions to the base-ring.

TRUNNION-SQUARE. An instrument used in inspecting guns for ascertaining if the axis of the trunnions is perpendicular to the axis of the bore.

Truss. A heavy iron fixture by which the centre of a lower-yard is held in position at the mast, and which forms the centre of motion of the yard. Before the invention of the iron truss, rope trusses were used, with which the yard was kept in the required position by means of tackles fitted to the lower ends of the truss-pendants. *Truss up*, to brail up a sail.

TRUSS-HOOP. A heavy iron band used in mast-making.

TRUSS-PARREL. That part of a rope truss which passes around the yard.

TRUSS-PENDANT. That part of a rope truss which is passed around the mast and to which the truss-tackles are fitted.

TRUSS-TACKLE. One of the tackles by which the pendants of a rope truss are hauled taut.

Truxtun, Thomas, Commodore U.S.N. Born in Jamaica, L. I., February 17, 1755. He went to sea early in life, and during the war of the Revolution established a high character for courage and nautical skill in command of the private armed vessels "St. James," "Mars," and "Independence." He was among the first to discuss and point out the value of the Gulf Stream to navigation. He was a fine navigator and prime seaman. In 1794 he published from "the Stone House, South Second Street, Philadelphia," "A Treatise on Latitude and Longitude," with an appendix on the formation of our (then) infant navy, and a plate showing "Truxtun's System of Masting a 44-Gun Frigate." He was commissioned a captain in the U. S. navy in 1794. February 9, 1799, while in command of the frigate "Constellation," he captured the French frigate "L'Insurgente." February 1, 1880, still in the "Constellation," he fought and drove into Curaçoa, in a sinking condition, the French frigate "La Vengeance," being prevented, by the loss of the "Constellation's" mainmast, from taking possession of his prize. For this action Congress awarded him a gold medal. He fought the first battle under the present naval organization, which he was largely instrumental in establishing. After the quasi-French war he commanded the West India Station, and finally was ordered to hoist his flag on the "President," 44, and assume command of the Mediterranean Squadron, when, some question arising as to his being allowed a captain to command the flag-ship, he resigned his commission, in 1802, and took up his residence in Philadelphia, of which city he was subsequently elected sheriff. He died May, 1823. His remains lie in Christ Church burying-ground, Fifth and Arch Streets, Philadelphia.

Try. A word meaning to *lie to*, but now seldom used. From this the *trysails* received their name. *To try back for a bend*, to pay back enough of a hawser to make a bend. *To try down*, to separate oil from blubber by melting. *To try the range*, to ascertain the distance of an object by firing at it.

TRYSAIL. A fore-and-aft-sail set on the fore and main lower-masts of a ship. It is bent to a gaff, and is considered a storm-sail, or one under which a vessel can lie-to easily during a gale. See TRY.

TRYSAIL-BRAILS. Ropes used in taking in a trysail.

TRYSAIL-GAFF. The gaff to which a trysail is bent.

TRYSAIL-MAST. A small mast placed abaft a lower mast, to which a trysail is bent by means of hoops.

TRYSAIL-OUTHAUL. A rope by which the head of a trysail is hauled out on the gaff.

TRY-WORKS. The boilers and furnaces used on whale-ships for trying down blubber.

T-square. A rule having a cross-piece at one end placed at right angles; used in draughting for making parallel lines.

Tub. A *division-tub* is furnished to each division of a ship-of-war, in which fresh water is placed during action. A *fire-tub* is placed on the berth-deck during action at the place where the empty passing boxes are received from the deck above. It is partially filled with water, and is fitted with a grating near the top. As a precaution against explosion from any fire that may be in the box, each one is inverted and struck over the tub before being refilled. *Grog-tub*, the tub in which the daily allowance of grog was formerly mixed, and from which it was served to the crew. *Match-tub*, a small tub having holes bored in its upper head, in which slow-matches were formerly placed during action.

Tube. A hollow cylinder of any material, the length of which considerably exceeds its diameter. A pipe. *Quill-tubes*, quill-primers. See PRIMER.

TUBE-EXPANDER. A tool for stretching or expanding the end of a tube in direction of its diameter, so as to cause it to fit snugly, and confine it, air-tight, to a *tube-sheet* or *-plate* by forming a *bead* on either side thereof.

TUBE-SHEET, or TUBE-PLATE. One of a pair of sheets of metal containing accurately-bored holes, to which the ends of the tubes of a steam-boiler, condenser, or other fluid-tight apparatus are secured, either by expanding or packing their ends. These sheets are firmly built in, and form part of the structure.

TUBULAR BOILER. A boiler in which a great portion of the *heating surface*, or the surface exposed to fire, is composed of tubes through or around which the heated gases of combustion circulate.

Tub-fish. A fish of the genus *Trigla* (*T. hirundo*); sapphirine gurnard.

Tuck. That part of a vessel in which the after extremities of the outside planking end, either on the wing-transom or against the tuck-timber.

TUCK-RAIL. A rail placed at the upper part of the wing-transom, forming an abutment and finish to the ends of the plank in square-sterned vessels.

Tucker, Samuel, a brave, able, and successful naval officer of the Revolution. Born in Marblehead, Mass., November 1, 1747; died at Bremen, Me., March 10, 1833. Son of a ship-master. He was apprenticed at 11 on board the "Royal George," and before the Revolution was a captain, sailing from Boston to London. Commissioned a captain in the Revolutionary navy, March 15, 1777, he took command, in November, of the frigate "Boston," in which, in February, 1778, he took out John Adams, minister to France. He took many prizes in 1779; aided in the defense of Charleston, S. C., and was a prisoner from its capture, in May, 1780, till June, 1781, when he took command of the "Thorn," and made many prizes. At the close of the war he received the thanks of Congress for his services. In 1792 he settled in Bristol, Me. In the war of 1812 he captured, by a ruse, a British vessel which had greatly annoyed the shipping of Bristol and vicinity. He was several times a member of the Legislatures of Massachusetts and of Maine.

Tug. A small steamer used for towing. Also, to row with great exertion and make but little progress.

Tugg (*Eng.*). A heavy cart for hauling ship-timber.

Tumble Home. To narrow in. Said of the sides of a vessel when they incline inboard after reaching a certain height.

Tumbler. An attachment to the jaws of a gaff to prevent chafe upon the mast. Also, a name sometimes given to the porpoise.

Tumble Up. To hurry on deck from below.

Tumbling Sea. A rough, irregular sea.

Tum-tum. A dish made in the West Indies from boiled plantain.

Tungula. The name of a small boat in the vicinity of Borneo.

Tunis. The kingdom and city of Tunis possesses, as its navy, 2 small armed steamers, an aviso of 500 tons, with 8 guns and engines of 160 horse-power, and a transport of 400 tons, with 2 guns and 140 horse-power. This small force is soon to receive an accession of 2 ironclad monitors, now being built in France.

Tunis, the capital of the state of the same name, is situated at the mouth of the Mejerda, on the west side of an oval lagoon connected by a narrow strait with a bay of the same name. It is surrounded by walls and defended by a strong castle, which completely commands the Goletta, or narrow strait already mentioned. The principal exports are oil, soap, wool, hides, cattle, sponges, senna, wax, gold-dust, etc. The manufactures are linen and woolen cloths, red woolen caps, pottery, and various essences. Lat. 36° 48′ N.; lon. 10° 24′ E. Pop. 125,000.

Tunny. A fish of the genus *Thynnus*, of the mackerel family, similar, in form, to the mackerel, but much larger, rounder, and with a shorter snout. It is one of the largest of fishes, tunnies weighing 1000 pounds not being rare in the Mediterranean. The tunny is considered excellent food.

Turbot. A flat-fish of the genus *Rhombus* (*R. maximus*), with a body nearly circular. It grows to the weight of 20 or 30 pounds, and is much esteemed by epicures. The name is applied in Scotland to the halibut.

Turkey, Navy of. The present effective armored fleet of this nation comprises 15 large ships of various types, and a small fleet of gunboats and river monitors. The ships are for the greater part of English and French build, several being of modern type, furnished with Armstrong guns, and engineered by Englishmen. Their principal officer, Hobart Pasha, was formerly an English naval officer. The Turkish navy also possesses 3 old wooden ships of the line, mounting an aggregate of 254 old smooth-bore guns; 5 wooden frigates, and 7 corvettes, mounting about 300 guns; also 21 smaller craft carrying about 80 guns. There are also 4 paddle-wheel vessels, mounting 4 guns each; 3 sailing-cruisers with an aggregate of 8 guns; and 22 dispatch-boats, mounting 64 guns in all. The most powerful ship is the "Mesoodiyeh," built by the Thames Ship-building Company, with machinery constructed by Messrs. Maudslay, Sons & Field. The length between perpendiculars is 332 feet; extreme breadth, 59 feet; depth of hold, 36 feet; mean draft, 25 feet; displacement, 8994 tons. The armor-plating on the sides is 12 inches thick, backed by the same thickness of East India teak. The armament consists of twelve 18-ton guns on the gun-deck, two 6½-ton guns on the forecastle and one of the same weight aft on the poop. The navy is represented in the cabinet by a minister of marine, and in the divan or chancellery by an assistant secretary. The service is divided into four sections,—personnel, matériel, naval constructions, and health. The *personnel* is constituted as follows:

Executive officers: vice-admirals, 6; rear-admirals, 11; captains of ships, 131; captains of frigates, 23; captains of corvettes, 54; lieutenant-captains of corvettes, 289; lieutenants of ships, 228; ensigns, 187. Total executive officers, 929. Mechanicians, 480; pay-officers, 33; medical officers, 47; staff-officers, 20. Marine officers: colonels, 2; lieutenant-colonels, 7; other officers, 82; total, 91. Total officers, 1600. Seamen, active, 6000; marines, 4500. Total officers and men, 12,100. The navy is recruited partly by voluntary enlistments and partly by conscription.

Turk's-head. An ornamental knot made in the upper end of a man-rope. See KNOT.

Turn. *To take or catch a turn*, to pass the bight of a rope over a pin or cleat in order to secure it. *Turn ahead*, to go ahead slowly, referring to the engine of a steamer. *To turn turtle*, to capsize. *To turn in*, to go to bed. *To turn in a dead-eye* is to fasten a shroud around it. *Turning-room*, sufficient room for a vessel to turn. *Turn in the hawse*; see HAWSE. *Turn of the tide*, the change from flood to ebb, and *vice versa*. *To turn out*, to get up. *Turn out the guard!* the order for the marines to form in line on the quarter-deck. *To turn over men, stores*, etc., to place them under the charge of another officer. *Turn the glass!* or *Turn!* the order to turn the time-

glass, in heaving the log, when all of the stray-line has run out. *To turn to windward*, to work to windward. *Turn up the hands!* an order for all hands to come on deck.

Turnbuckle. A link for connecting two parts of a bar or rod together, and adjusting the whole to proper length or tension. Both ends of the link may be fitted to screw-threads, one right-handed and the other left-handed, or one end may be provided with a screw-thread and the other with a swivel. The link is turned by means of a bar or a wrench.

Turner, Thomas, Rear-Admiral U.S.N., is a native of Virginia. Appointed midshipman from Virginia, April 21, 1825; attached to frigate "Constellation," Mediterranean Squadron, 1827; sloop-of-war "Warren," Mediterranean Squadron, 1830.

Promoted to passed midshipman, June 4, 1831; frigate "Constellation," Mediterranean Squadron, 1834, and frigate "Delaware," same squadron, 1835.

Commissioned as lieutenant, December 22, 1835; frigate "Columbus," East India Squadron, 1840; receiving-ship at Philadelphia, 1843; sloop "Albany," Home Squadron, 1847. Lieut. Turner was actively engaged in the war with Mexico, and was present at Tuspan, April 7, 1847; receiving-ship at Philadelphia, 1850; frigate "Congress," Brazil Squadron, 1851–53; on ordnance duty, 1854–57.

Commissioned as commander, September 14, 1855; commanding sloop-of-war "Saratoga," Home Squadron, 1859–60. Commander Turner was in command of "Saratoga" in the engagement between that vessel and two Spanish steamers, the "Marquis of Havannah" and "General Miramon," in the harbor of Anton Leyardo, Mexico, when they were captured, March 6, 1860, at midnight.

Commissioned as captain, July 16, 1862.

Commissioned as commodore, December 13, 1863; commanded frigate "New Ironsides," special service, 1863; commanded frigate "New Ironsides" in the attack upon Forts Sumter, Moultrie, and Beauregard, in Charleston harbor, April 7, 1863. Admiral Dupont was on board the "New Ironsides," and commended Commodore Turner for the judgment and ability with which he handled his vessel. Special duty, New York, 1864–65; special duty, Philadelphia, 1866–67; on ordnance duty, Philadelphia, 1868.

Commissioned as rear-admiral, May 27, 1868; commanding Pacific Fleet, 1869–70. Retired April 21, 1870.

Turnpike-sailor (*Eng.*). An impostor, dressed as a sailor and asking charity.

Turret. See IRONCLADS.

Turtle. The popular name of a marine reptile having fin-like paddles instead of legs, suited for swimming and not for walking. They deposit their eggs in the sand on the beach, two hundred being sometimes found in a single nest. Some of the species feed on aquatic plants, others on crustaceans, mollusks, and fishes. The flesh of those who feed on vegetable matter is much esteemed for food.

The *green turtle* (*Chelonia mydas*) attains a weight of 700 to 800 pounds: the name is derived from the color of its fat. The *hawkbill turtle* is valuable as yielding the best tortoise-shell. *To turn turtle*, to capsize.

TURTLE-CRAWL. A shallow pond where turtles are kept.

TURTLE-PEG. A kind of spear for taking turtle.

Tusk (*Eng.*). A fish,—the *Brosmus vulgaris.*

'Tween-decks. A contraction of *between-decks.* The lower deck of a merchant vessel. The space between two decks.

Twice-laid Rope. Rope made from second-hand yarns.

Twiddling-line. A former name for a line used to steady the wheel when not in use.

Twig. A slang term, meaning to know or observe.

Twig-ait (*Eng.*). A place where osiers grow.

Twilight (Sax. *tweon-leoht*, doubtful light). Twilight begins and ends when the sun is about 18° below the horizon; and its duration, therefore, varies with the latitude, for the time which is required for the sun to rise through 18° vertically depends upon the inclination of its diurnal path to the horizon of the place, and is greater as this inclination is less,—*i.e.*, the higher the latitude. The twilight is the best time for observing the altitudes of the stars at sea, for then the horizon is in general clearly visible and distinctly marked.

Twine. Small cord.

Twin-screws. A pair of screw-propellers arranged with one under each quarter of a vessel, and driven by separate engines, so that one may back while the other is going ahead, or that both may act together in either direction. This arrangement gives great handiness to the ship, and for light-draft vessels two screws are more efficient in a seaway than a single one.

Two-blocks. The condition of a tackle when both blocks have been drawn together.

Two-handed Fellow. A name applied to a man who has served both as a sailor and a marine.

Twy. The name given to a sudden squall on some parts of the English coast.

Tye. That part of the purchase for hoisting a topsail-yard which is attached to the yard, and passes through the sheave-hole in the mast or the tye-block at the mast-head.

TYE-BLOCK. A block sometimes used at the head of a topmast in place of a sheave in the mast, through which the topsail-tye is rove. A tye-block is sometimes used on the topsail-yard in order to increase the purchase, the standing-part of the tye being fastened to the mast-head.

Tymoom. A boat used on Chinese rivers.

Tyndarides. The ancient name for the luminous appearance now called *corposants.*

Typhoon (Gr. *tuphōs*, a violent wind which whirls up clouds of dust or mist). The name given to the hurricanes or revolving storms which occur in the China Sea and Indian Ocean at the seasons of the change of the monsoons. See STORM, REVOLVING.

U.

U. Abbreviation for *you* in the U. S. General Service Signal Code. In the log-book, *u* denotes *ugly threatening weather.*

Udometer. A rain-gauge.

Ugly. Disagreeable; dangerous; threatening,—applied to the weather or sea.

Ulcus. An old term for the hulk of a ship.

Uliginous. Muddy; slimy.

Ultra Mare. Beyond the sea.

Ultra-zodiacal. Beyond the limits of the zodiac.

Umber. An African bird of the family *Ardeidæ*, allied to the storks, but having a compressed bill with a sharp ridge.

Umbrina. A genus of acanthopterygious fishes, common in the Mediterranean, and found also upon the shores of England. The flesh is white and of good flavor, and some of the species are remarkable for their beauty.

Under. *Under canvas*, under sail. *Under foot*, under the bows,—said of the anchor when the chain is nearly perpendicular. *Under manned*, short-handed; having an insufficient number of men. *Under masted*, having masts too short or too slender to allow of sufficient sail being carried. *Under sail*, propelled by the action of the wind on the sails. *Under steam*, propelled by steam-power. *Under the lee*, sheltered from the wind by some intervening object. *Under the sea*, lying-to in a gale, and making bad weather of it. *Under way*, see WAY. *To under-run a hawser*, to haul a boat along under a hawser, lifting it out of the water.

Under-beveling. See BEVEL.

Under-bright. The bright streak which often appears under clouds near the horizon.

Under-current. A stream which sets beneath the surface-water of the sea whilst that is either in a quiescent state or moving in a contrary direction. Swift rivers may run out at the surface whilst the flood-tide runs in below.

Under-tow. An under-current found at the mouths of rivers and in tide-waters.

Underwriter. An insurer; so called from his underwriting or subscribing the policy of insurance. See MARINE INSURANCE.

Undines (Lat. *unda*, a wave). A name given in the fanciful system of the Paracelsists to the elementary spirits of the water. They are of the female sex, and intermarry with human beings.

Undress-uniform. See UNIFORM.

Unicorn. An old name for a howitzer.

Unicorn-fish. The sea-unicorn, or narwhal.

Uniform for the U. S. Navy. *Full-dress uniform, to be worn on occasions of special ceremony.*—Body-coat, epaulets, cocked hat, sword with sword-knot, and blue cloth pantaloons.

Undress-uniform for official visits.—Frock-coat, epaulets, cocked hat, sword with knot, and blue cloth or white drilling pantaloons to suit the season, weather, or climate.

Service-dress uniform.—Frock-coat with shoulder-straps, cap, pantaloons, blue or white, to suit the seasons of the year, weather, or climate.

Officers making special official visits of ceremony to the President of the United States, the Secretary of the Navy, or to foreign authorities and vessels of war, wear the full-dress uniform.

When making an official visit to the President of the United States, the Secretary of the Navy, or to the heads of other Departments of the government, and to foreign authorities and vessels of war, officers wear the undress-uniform or the service-dress, as occasion may require.

Officers serving on courts-martial, courts of inquiry, boards of examination or special boards, or when attending as witnesses before courts-martial or courts of inquiry, or in any other capacity, wear the service-dress uniform, without swords, unless otherwise specially directed by competent authority.

Officers, in their social intercourse, when it is requisite for them to appear in evening-dress, may wear a body-coat of blue cloth, after the prevailing style of a civilian's dress-coat, with rolling collar, five navy buttons on each side, two at the waist behind, and two at the bottom of the skirt. The lace and corps distinctions on the cuff, same as on full-dress coats. This coat may be worn with or without epaulets, but not with shoulder-straps or sword.

It is optional with officers to wear their uniform while on duty in the Navy Department, at the Observatory, Hydrographic Office, or on light-house duty ashore.

Service-dress uniform is worn by all officers when attached to any vessel of the navy or coast survey, to any navy-yard or station, or to any hospital or other naval establishment, for duty, unless when absent on leave.

Chaplains, when performing divine service, may wear either the vestments of the church to which they belong, or the uniform prescribed in the regulations.

Gloves worn with uniform are always to be white.

Officers on furlough will not wear their uniform, and officers are strictly prohibited from wearing any part of it while suspended from duty by sentence of a court-martial.

Officers are forbidden to wear any part of their uniform with citizen's dress. They must wear the whole of their uniform or none.

Full dress.—The full-dress body-coat for all commissioned officers is of navy-blue cloth, swallow-tailed, double-breasted, and lined with white silk serge; two rows of large navy buttons on the

breast, nine in each row ; standing collar, to have one strip of gold-embroidered white-oak leaves for admiral and vice-admiral; to have a strip of navy gold lace one inch wide around the top and down the front for rear-admirals, commodores, captains, and commanders, and one-half inch wide for lieutenant-commanders, lieutenants, masters, and ensigns.

All staff-officers wear the same widths of gold lace around the top and down the front of the collars of their full-dress body-coats as prescribed for line-officers with whom they have relative rank, respectively.

Midshipmen, after graduation, are allowed a full-dress double-breasted coat, nine buttons in each row, with a gold cord around the sleeve, and an anchor in gold embroidery on each side of the collar.

The full-dress coat is worn only with epaulets, cocked hat, sword and sword-knot.

Midshipmen at the Naval Academy wear a strip of lace one-eighth of an inch wide around the outer edge of the collar of their parade-jackets.

The undress and service frock-coat.—The undress and service frock-coat for all commissioned officers is of navy-blue cloth, faced with the same, and lined with black silk serge; rolling collar; double-breasted, with two rows of large navy buttons on the breast, nine in each row.

Frock-coats for midshipmen are the same as for commissioned officers, except that the buttons will be of medium size only.

The uniform coat for boatswains, gunners, carpenters, and sail-makers is a frock-coat similar in every respect to the frock-coat of the line and staff commissioned officers.

Clerks and mates wear a double-breasted frock-coat, with nine navy buttons of medium size on each side.

Sleeve ornaments.—An admiral has three, a vice-admiral two, and a rear-admiral one, strips of gold embroidered white-oak leaves on the cuff of the full-dress coat. The undress-coat of an admiral has one two-inch, and three half-inch strips of gold lace on the cuffs. A vice-admiral has but two strips of half-inch lace above the two-inch strip. A rear-admiral has only one strip.

Commodores wear one strip of two-inch gold lace on the cuffs of both full-dress and undress-coats; captains, four strips of half-inch lace; commanders, three; lieutenant-commanders, two, with a strip of quarter-inch lace between; lieutenants, two; masters, one; ensigns, one quarter-inch strip; and midshipmen a gold cord.

Staff-officers wear the same as line-officers with whom they rank, the corps being distinguished by differently-colored cloth between the strips of gold lace. Medical officers wear cobalt-blue; paymasters, white; engineers, red; naval constructors, dark violet; professors of mathematics, olive-green.

All line-officers wear a five-rayed star above the gold lace on the cuffs, the star for an admiral having a steam-frigate raised in the centre.

Epaulets, shoulder-straps, etc.—All commissioned officers above the rank of ensign wear two gold-bullion epaulets, with their respective strap ornaments on the frogs.

All shoulder-straps are of navy-blue cloth with a border embroidered in gold. The centre and end ornaments, corps distinctions, and indications of rank are as follows:

Admiral, four silver stars, with a gold foul-anchor under each of the outer stars.

Vice-admiral, three stars, with an anchor under the centre star.

Rear-admiral, two stars, with a silver foul-anchor in the centre.

Commodore, one star, with a foul-anchor at each end of the strap.

Captain, a silver spread-eagle, with a foul-anchor at each end of the strap.

Commander, two silver oak-leaves, with a foul-anchor in the centre.

Lieutenant-commander, two gold oak-leaves, with a foul-anchor at each end.

Lieutenant, two gold bars at each end, a foul-anchor in the centre.

Master, one gold bar at each end, a foul-anchor in the centre.

Ensigns and midshipmen wear shoulder-knots in lieu of straps or epaulets.

Staff-officers wear the same strap as the line-officers with whom they hold relative rank, with the following exceptions: medical officers omit the anchor; paymasters substitute an oak-sprig for the anchor; engineers, a device formed of four oak-leaves in the form of a cross; naval constructors, two oak-leaves and an acorn; chaplains, a silver cross; professors of mathematics, one oak-leaf and an acorn; secretaries, the letter S in silver.

In lieu of shoulder-straps, boatswains and gunners wear on each side of the collar a gold star; carpenters and sail-makers, a gold diamond.

Cocked hat, cap, etc.—All commissioned officers above the grade of ensign wear a black cocked hat bound with black silk lace, and ornamented with a gold loop and a black cockade. Cocked hats are always worn with epaulets.

The cap is of dark-blue cloth, with a plain black silk band, and may be worn with a black glazed, or a white linen cover, as circumstances demand. The cap ornament for all commissioned officers and midshipmen is a silver shield, with a silver eagle and two crossed anchors in gold. A double-looped gold cord is also worn. Warrant-officers wear two gold anchors crossed. Mates wear a plain, vertical, gold anchor.

Pantaloons.—For full-dress the pantaloons of all commissioned officers is of blue cloth, with a heavy strip of gold lace down the outer seams. For undress and service-dress, pantaloons are of blue cloth or white duck.

Vests.—Single-breasted, standing collar, nine small buttons, and made of navy-blue cloth or white duck.

Jackets.—Jackets may be worn as service-dress, except at general muster, or on occasions of special ceremony. They are of navy-blue cloth, with a rolling collar, and trimmed in the same manner as the service-coat. White linen jackets without straps and sleeve ornaments may be worn in warm weather.

Sack-coats.—Single-breasted sack-coats with standing collar, cuffs trimmed with black lace in lieu of gold, with the shoulder-strap device (omitting the duplicate end device) on the collar, may be worn under certain circumstances.

Overcoats.—Overcoats are of heavy navy-blue beaver or pilot cloth, with or without a cape; double-breasted, five buttons on each breast.

On the collar are worn the devices authorized for sack-coats. Mates, clerks, and warrant-officers wear no device on their overcoats.

Swords, sword-belts, etc.—The sword has a cut-and-thrust blade, half-basket hilt, white grip, and a black leather scabbard, with mountings of yellow gilt. Midshipmen may wear a dirk.

The full-dress sword-belt of admiral and vice-admiral is of navy-blue cloth with a gold cord around the edge, and a strip of gold-embroidered white-oak leaves running through the centre. The full-dress sword-belt of all other commissioned officers is of blue webbing with gold cord woven in, the arrangement of the gold cord indicating the rank of the wearer. The service-dress sword-belt for all officers is of plain black glazed leather.

The sword-knot for all commissioned officers is a gold strap 24 inches long, including the tassel, gold slide, tassel of twelve gold bullions and basket-worked head.

Union. The upper inner corner of a flag, which generally contains objects emblematical of the country represented by the flag. Thus, the union of the flag of the United States is a blue field containing a white star for every State. In small flags there are ordinarily but thirteen stars,—one for each of the original States. When a ship hoists her flag *union down* it is a signal of distress.

Union Coupling. A contrivance for joining two sections of small pipe, so that they may be readily connected or disconnected without disturbing other joints. It consists mainly of a pair of cylindrical shells, screwed or otherwise secured to the ends of the pipes, one of which, the *male part*, has a screw-thread cut upon its outer surface, and the other a flange which retains a flanged ring, free to turn and provided with suitable projections (usually forming a hexagon) to receive a wrench, and on the interior surface of which is cut a *female screw-thread* matching the thread of the male part. The joint between the two parts is made fluid-tight by washers or packing of leather, gum, cotton-wicking, etc. See HOSE-COUPLING.

Union Jack. A small flag corresponding in appearance to the union of the national flag. See JACK.

Universal Coupling. A coupling which permits the parts united to assume various angular relations to each other.

Universal Joint. A contrivance for coupling rotating shafts whose axes intersect each other in a point. A joint, or system of joints, so arranged between two pipes or sections of pipe that their axes may be turned in any direction relatively one to the other.

Unrig. To strip of rigging.

Unukalhai. The star *α Serpentis.*

Up. The helm is *up* when the tiller is borne over to windward. *Up anchor!* the boatswain's cry to the men to take their stations for weighing anchor. *Up-and-down*, perpendicular; vertical. *Up boats!* the order to the men to take their stations for running the boats up to the davits. *Up courses!* the order to haul up the courses.

Uphroe. A wooden slat with a range of holes through which the small lines of a crow-foot are rove.

Upper Deck. The spar-deck.

Upper-works. The ship's frame above the water-line.

Upshur, John H., Commodore U.S.N. Born in Virginia, December 5, 1823. Appointed from Virginia, November 4, 1841; attached to frigate "Congress," Mediterranean Squadron, 1841–43; sloop "St. Mary's," Mediterranean Squadron, 1843–46; Home Squadron, during Mexican war; in the Naval Battery, during the bombardment of Vera Cruz; Naval School, 1847.

Promoted to passed midshipman, August 10, 1847; frigate "Cumberland," Mediterranean Squadron, 1849–50; ordnance duty, 1852; store-ship "Supply," East India Squadron, 1853–56.

Promoted to master, 1855.

Commissioned as lieutenant, September 14, 1855; ordnance duty, Washington Navy-Yard, 1856–57; sloop "Cumberland," coast of Africa, 1858–59; instructor at Naval Academy, 1859–60; North Atlantic Blockading Squadron, 1861; at capture of forts at Hatteras, N. C.; steam-frigate "Wabash," South Atlantic Blockading Squadron, 1861; present at battle of Port Royal; commanding steamer "Flambeau," South Atlantic Blockading Squadron, 1862–63; several expeditions up the rivers of South Carolina.

Commissioned as lieutenant-commander, July 16, 1862; commanding steam-frigate "Minnesota," flag-ship North Atlantic Blockading Squadron, 1863–64; commanding steamer "A. D. Vance," North Atlantic Blockading Squadron, 1864–65; at capture of Fort Fisher, January, 1865; commanding steamer "Frolic," European Squadron, 1865–67.

Commissioned as commander, July 25, 1866; commanding apprentice-ship "Saratoga," 1868–70; special duty, New London, Conn., 1871–73.

Commissioned as captain, January 31, 1872; commanding "Brooklyn" (second-rate), South Atlantic Station, 1875–76; member Board of Inspection, 1877–80.

Promoted to commodore, July 11, 1880.

Uptake. The portion of a marine steam-boiler in which the gases of combustion, after having passed through the flues or tubes, are collected and turned upwards toward the chimney.

Uranus. In 1781, Sir William Herschel discovered what was thought to be a comet; further observation proved it to be a planet. Herschel proposed to name it Georgium Sidus in honor of the reigning king of England. Laplace proposed to call it Herschel for its discoverer. It finally received the name of Uranus, who in ancient mythology was the father of Saturn. Its mean distance from the sun is 1828 millions of miles; diameter, 36,000 miles; apparent diameter, 4″; period of revolution, 84 years. It is attended by 4 satellites at distances varying from 120,000 to 380,000 miles. Contrary to the general law, the motion of the satellites in their orbits is retrograde. Symbol ♅, the initial of Herschel, with a globe suspended from the cross-bar.

Urca. An armed Spanish fly-boat.

Ursa Major (*Lat.* "The Greater Bear"). The most brilliant constellation of the northern hemisphere, consisting of 7 principal stars. By the common people of most countries this group is called *the wagon, the great dipper*, and sometimes *the plow;* in England it has been known as *Charles's wain.* The four stars, α, β, γ, δ, form a

trapezium, the longest side of which contains α and δ, γ being in the opposite angle to α; next to δ is affixed a scalene triangle, formed by the stars ε, ζ, η, which represent the tail of the Bear. The two stars β and α are called *the pointers*, as they point to the pole star. They are 5° apart, and hence convenient to measure distances by. α *Ursæ Majoris*, Dubhe; β, Merak; γ, Phecda. The star at the bend of the handle is called Mizar; near it is a small star (Alcor), which was regarded in early days as a test of keen vision; the Arabs called it Saidak, or *the proof*. It is now easily seen.

Ursa Minor (*Lat.* "The Lesser Bear"). A constellation popularly known as *the little dipper*. It is similar in form to *Ursa Major*, the trapezium of the one being adjacent to the triangle of the other. α *Ursæ Minoris*, Polaris; β, Kochab. See POLARIS.

Usages. Besides the general laws of merchants, there are certain commercial and seafaring usages which prevail in particular countries with the force of law. Underwriters are bound by usages; and they are legal precedents binding in courts-martial.

Ushant Team (*Eng.*). The sobriquet given to that portion of the Channel fleet which blockaded Brest.

V.

V. In the log-book, *v* denotes *visibility of distant objects.*

Vacuum-gauge. An instrument for indicating the degree of vacuum, or the preponderance of the atmospheric pressure over that of the air, vapor, or gas contained within a vessel, such as the receiver of an air-pump or the condenser of a steam-engine. Like a steam- or pressure-gauge, it depends for its action upon the resilience of metal or the height of a column of mercury or water. The indications are observed either by an index on a disk, or a scale showing the varying height of a column of liquid; and the unit of measure is usually considered as one inch in height of a column of mercury.

Vacuum-pump. A pump for exhausting an air-tight chamber or reservoir of its fluid contents, leaving a vacuum within.

Vacuum-valve. A valve for admitting air or other fluid to a vacuum within a vessel or chamber, and restoring equilibrium with atmospheric pressure. The *reverse-valve* of a steam-boiler is sometimes called a *vacuum-valve.* See REVERSE-VALVE.

Vail. An old word for *lower;* as, to vail the topsails as a salute or in token of submission.

Vakka. A large canoe of the Friendly Islands.

Vallejo is situated on the northeastern shore of San Pablo Bay, at the mouth of Napa Creek, and near the west end of the Strait of Carquinez, in Solano County, Cal. It has a large and safe harbor, and is accessible to the largest sea-going ships. It has several flouring-mills, ship-yards, and shoe-factories. Large quantities of grain are shipped here. It has manufactories of steam-engines, boilers, sash, doors, etc. A U. S. navy-yard is located here, on Mare Island, for a description of which see NAVY-YARD, MARE ISLAND, CALIFORNIA. Pop. 10,000.

Valparaiso, the capital of the province of the same name, and the principal port of Chili, is situated on a large bay in the Pacific, in lat. 33° 1′ 56″ S., lon. 71° 41′ 45″ W. The Bay of Valparaiso is of a semicircular form, and capable of accommodating a very large fleet. It is well sheltered on the east, south, and west, but is entirely open toward the north; and during the prevalence of winds from this quarter in the winter season, accompanied by a heavy, rolling sea, the shipping is much exposed. The city is the greatest commercial port of the Pacific coast of South America; about 3000 vessels enter and clear the port annually, and the city has an import trade of $35,000,000, and the exports amount to $15,000,000. Pop. 98,000.

Valve. In mechanism, a contrivance for controlling the flow of confined fluids. *Automatic valves*, used in pumps, are usually made of hinged plates or of flexible material, such as leather, gum, etc., or consist of lifting disk-valves guided by spindles or vanes. These valves, which are fitted to seats having necessary openings for the passage of the fluid, yield readily to its pressure in one direction; but, by their weight or resilience, descend to their seats and prevent its reflux when the pressure ceases; *stop-valves*, or valves for regulating the flow of fluid, are so arranged as to be opened, closed, or adjusted by hand; and the *steam-* and *exhaust-valves* of engines, of which there are many varieties, are actuated by mechanism called *valve-gear*.

VALVE-CHAMBER. A chamber which contains a valve (or set of valves) with its seat, guides, and guards, and in which it performs its functions.

VALVE-GEAR. The mechanism by which the valves of a steam-engine are actuated by the main running-gear. It includes eccentrics, eccentric straps and rods, links, pins, cross-heads, rock-shafts, and arms or levers, valve-stems, etc.

VALVE-SEAT. The surface upon which a valve bears when closed, and to which it is so accurately fitted as to prevent the passage of fluid.

Van. That part of a fleet which is in front.

Vancouver, George, navigator and explorer of the northwest coast of America. Born about 1757; died May 10, 1798. Entering the navy in 1771, he accompanied Capt. Cook in his two last voyages, and in the latter part of 1780 was appointed a lieutenant; in 1790 he was made master and

commander of the "Discovery," in which ship he was sent out to ascertain if there existed in North America, between the 30th and 60th degrees of north latitude, an interior sea, or any canals of communication between the known gulfs of the Atlantic and the great sea. He sailed from England April 1, 1791, and after an examination of the Sandwich Islands, crossed, in March, 1792, to the American coast, where he received the surrender of Nootka from the Spaniards, and spent the summers of 1792–94 in surveying the coast as far north as Cook's Inlet, wintering in the Sandwich Islands. He considered his explorations to have settled the question of a northwest passage in the negative. Vancouver's Island was named by him. On his return he surveyed most of the west coast of South America from the island of Chiloe, visiting the chief Spanish settlements. He was made a post-captain in 1794, and arrived in London in November, 1795, in a state of declining health from the effects of his voyages, but devoted himself to the arrangement of his manuscripts for publication until within a short time of his death. His Voyages, edited by his brother, was printed at the expense of the government, and was shortly afterward translated into French, German, and Swedish.

Vangee. A contrivance for working the pumps of a vessel by means of a barrel and crank-breaks.

Vangs. Ropes from the end of a gaff to the side of the ship to steady the gaff.

Variables. Those parts of the sea where a steady wind is not expected.

Variation. The angle which the magnetic meridian makes with the geographical meridian. See COMPASS.

VARIATION-CHART. A chart on which is shown, by curved lines, the variation of the compass.

Veer. To pay out a rope. To wear ship. To change direction,—applied to the wind; the wind *hauls* forward and *veers* aft. It is also said to veer when it changes direction against the sun.

Vega. The star *α Lyræ*. See LYRA.

Vein. Clear water in the openings between ice-floes.

Velocity (Lat. *velox*, swift). Rate of motion. The velocity of a body is uniform when it passes through equal spaces in equal times, and variable when the spaces passed through in equal times are unequal. Velocity is purely a relative term, for there is nothing which in itself is either swift or slow, any more than great or small. The velocity of a cannon-ball appears very great, yet it is slow compared with the motion of a point on the earth's equator, carried round by the diurnal motion; and this, again, is far inferior to the velocity of the earth in its orbit, which in its turn is greatly exceeded by the velocity of light.

Initial velocity, in gunnery, is the velocity of the projectile at the muzzle of the piece; called also *muzzle velocity*.

Remaining velocity is the velocity of a projectile at any point of its flight intermediate between the piece and the point of striking.

Terminal velocity is the velocity with which the projectile strikes its object.

Final velocity is the uniform velocity with which a projectile, descending through the air, moves after the resistance of the air has become equal to the accelerating force of gravity. It is directly proportional to the product of the diameter and density of the projectile, and inversely proportional to the density of the air.

Vena Contracta. The contracted portion of a jet of fluid issuing from an orifice in a thin plate always observed at a short distance from the orifice, the effective area of which is thus reduced, at an average, to about five-eighths its actual area.

Vendace. A rare species of trout, found in Lochmaben, Dumfriesshire, Scotland; *Coregonus Willughbii.*

Vendaval. A stormy time on the coast of Mexico, in the autumn, with violent thunder, lightning, and rain.

Venice, a fortified city of Northern Italy, one of the noblest, most famous, and singular cities in the world, is built upon a crowded cluster of islets in the lagoons of the same name, on the northwest of the Adriatic Sea, in lat. 45° 25′ N., lon. 12° 20′ E. Immediately west of the island of Lido are the islands on which Venice is built, and immediately south of it is the Porto di Malamocco, now the deepest entrance to the lagoon, and the seaway for vessels of the greatest draft. Venice was for many years the first maritime and commercial power of the world. The islands upon which it is built are 80 in number, are intersected by 147 canals, and are divided into two great groups by the Grand Canal, which is about two miles long and from 160 to 230 feet broad. Many of the inhabitants are employed in fishing and in navigating vessels belonging to the port, of which there are about 30,000. The value of the imports is about $25,000,000, and exports $12,500,000. Lat. 45° 25′ 49.5″ N.; lon. 12° 21′ 8″ E. Pop. 129,000.

Vent. The aperture through which fire is communicated to the charge of a gun. An axial vent is supposed to give a slight increase of initial velocity.

VENT-DRILL. A machine for clearing the vent of a gun when choked.

VENT-PLUG. A leather stopper for the vent of a gun not in use.

Venus. When most brilliant, Venus is about 40° from the sun. When it appears in the southwest just after sunset, it is known as the *evening star*,—the Greeks called it Hesperus. When it appears in the southeast just before sunrise, it is called the *morning star*, or Lucifer. Transits of Venus across the disk of the sun are of special importance in determining the solar parallax; the next one occurs in December, 1882. Diameter, 7600 miles; mean distance from the sun, 69 millions of miles. Symbol ♀, representing a mirror.

Vera Cruz, the capital of the state of Vera Cruz, Mexico, is situated in a sandy, marshy, and unhealthy plain on the southwest shore of the Gulf of Mexico. It is defended by the strong castle of San Juan de Ulloa, built upon an island about half a mile from the shore. The harbor, a mere roadstead between the town and the castle, is very insecure, having neither good anchorage nor sufficient protection from the north winds. It is provided with a good stone mole, and on the island of San Juan de Ulloa there is a light-house, showing a brilliant revolving light,

89 feet above the sea. The trade of this city is equal to that of all the other Mexican ports combined. The chief exports are the precious metals, cochineal, sugar, flour, indigo, provisions, leather, vanilla, soap, logwood, and pimento. Lat. 19° 11′ 54″ N.; lon. 96° 8′ 36″ W. Pop. 16,000.

Veritas. A register of shipping established in Paris, on the principle of Lloyd's List. See CLASSIFICATION.

Vernal Equinoctial Point. The first point of Aries. See EQUINOCTIAL POINT.

Vernal Equinox. See EQUINOX.

Vernier. A small graduated scale for the measurement of minute divisions on the limb of a sextant, scale of a barometer, etc.

Vertical Circles. Great circles of the sphere intercepting each other in the zenith and nadir, and cutting the horizon at right angles.

Vespucci, Amerigo, was born at Florence, March 9, 1451. His first voyage was in the expedition commanded by Admiral Hojeda, which sailed from Cadiz, May 20, 1499. The continent of America received its name from this navigator in virtue of his having sailed along the coast, and being the first to publish an account of the New World. But the discovery by Columbus was anterior to the voyage of Vespucci. Upon his return to Europe he was sent to Brazil, and after this his voyages were unimportant. He died at Seville, February 22, 1512.

Vessel. A general name for all the different sorts of ships, boats, etc., navigated on the ocean or on rivers and canals.

Vessels, Title to. The title to a vessel rests in an instrument in writing, in the nature of a bill of sale, which is required by law to be duly acknowledged before a notary public, or other officer authorized to take acknowledgment of deeds. This instrument, as well also as every mortgage, hypothecation, or conveyance of any vessel, or part of any vessel, must be recorded in the office of the collector of customs where such vessel is registered or enrolled; and without such record no bill of sale, mortgage, hypothecation, or conveyance, is valid against any person other than the grantor or mortgagor, his heirs and devisees, and persons having actual notice thereof. It is made the duty of the collector to record all such bills of sale, mortgages, hypothecations, or conveyances, and also all certificates for discharging and canceling any such conveyances, in books kept for that purpose, in the order of their reception; noting in such books, and also on the instrument itself, the time when the same is received, and to certify on the bill of sale, mortgage, hypothecation, or conveyance, or certificate of discharge, or cancellation, the number of the book and page where the same is recorded. All bills of sale of vessels registered or enrolled are required to set forth the part of the vessel owned by each person selling, and the part conveyed to each person purchasing. See Revised Statutes U. S., Sections 4192, 4193, 4196.

Via Lactea. See GALAXY.

Vice-Admiral. See ADMIRAL.

Victualer. A vessel which carries provisions. In early days each man-of-war had a victualer especially attached to her; as, in Henry VIII.'s reign, we find the "Nicholas Draper," of 140 tons and 40 men, was victualer to the "Trinity Sovereign"; the "Barbara" of Greenwich to the "Gabriel Royal," and so on.

Vi et Armis. By force of arms.

Vigia. A hydrographical warning on a chart, to denote that the pinnacle of a rock, or a shoal, may exist thereabout.

Villeneuve, Peter Charles John Baptist Sylvester de, a French vice-admiral, was born at Valensoles in 1763, and died at Rennes in 1806. He entered the navy in 1778, and had attained the rank of *capitaine de vaisseau* when the French Revolution occurred. He was made a rear-admiral in 1796, and ordered to take part in the Irish expedition, but failed to do so, on account of adverse winds detaining the vessels of his squadron. In the Egyptian expedition he had a command, and was in charge of a division of the French fleet at the battle of Aboukir, and came out of that terrible action with four vessels, which he succeeded in taking to Malta.

In 1801, Napoleon, being then first consul, placed him in command of Martinique, and in 1804 promoted him to be vice-admiral, intending to place him in charge of the naval forces during the contemplated descent upon the English shores, for which such extensive preparations were making at Boulogne and elsewhere. The plan was for Villeneuve and his fleet, in combination with the Spanish fleet, under Admiral Gravina, to sail for the West Indies, as if to operate against the British possessions there, and thus to draw off the bulk of the British fleet in pursuit. He was then quickly and secretly to return to Europe, enter the Channel, and there find the rest of the French fleet concentrated to protect the crossing of the army, while the English were searching for him in far distant seas. Villeneuve sailed from Toulon in January, 1805, with 28 sail of the line, but put back on account of bad weather, and by delay disarranged plans which depended upon too many contingencies. He did not join Gravina at Cadiz until April 9, at least two months later than the arrangements called for. With the combined fleet he then sailed for the West Indies, where he took Fort Diamond, and captured a valuable convoy. During this time Nelson, who was ignorant of his destination, was scouring the Mediterranean in search of him, but came back from Egypt to Naples, no wiser than he went. At last he got upon Villeneuve's track, followed him, and was reported at Barbadoes. The French admiral, having drawn the English fleet to a great distance, then hastened to return to Europe. He captured on the passage a most valuable prize in a privateer with a rich lading of specie captured from the Spaniards, but unfortunately he was detained by bad weather, and was 42 days between the Azores and the Continent. Off Cape Finistère his fleet encountered that commanded by Sir Robert Calder, consisting of 19 vessels, and an engagement followed, which was by no means decisive, and the inferior English fleet withdrew, after inflicting much damage upon that of the allies. This equivocal victory irritated Napoleon exceedingly, and he caused a note to be printed in the *Moniteur*, which may be rendered as follows:

"If we can some day find a man combining character, courage, coolness, and audacity, the world will see what our sailors are capable of accomplishing."

This severe reflection upon Villeneuve was caused by his delay interfering so seriously with Napoleon's plans, who did not consider that he could not control the weather, and who resented fiercely Villeneuve's failure to destroy or capture Calder's squadron. It was not yet too late for the invasion to have taken place, if the combined fleet had made for Brest; but Villeneuve saw fit to go into Cadiz, where Nelson, who had returned from his fruitless cruise, at once blockaded him, and Bonaparte was obliged to give up his cherished plan, especially as the state of affairs in Austria forced him to give his personal attention in that direction. Villeneuve, deeply mortified by Bonaparte's reprimand, determined to re-establish himself in the emperor's favor by a brilliant and decisive action with the English fleet. Alluding to the note in the *Moniteur*, he wrote to the Minister of Marine: "If it be true that nothing but firmness and audacity are needful, I will leave nothing to be desired on that score the first time that I go to sea."

He was, indeed, at that time making up his mind to measure forces with his great adversary, Nelson. Villeneuve finally sailed from Cadiz on the 21st of October, with 33 ships of the line, French and Spanish. The English fleet had the same number, but some preponderance in weight of metal, and a great advantage in discipline and ability to manœuvre. The plan of battle which the French admiral had laid down was rendered nugatory by the audacious movements of Nelson, who, at the very outset, broke the French line, and fought the two wings separately. It was Napoleonic strategy applied to a sea-fight. The whole world knows the story. Villeneuve, in the "Bucentaur," was soon overmatched and captured, and the French navy received that day a blow from which it was many a year in recovering, while the English lost Nelson.

Napoleon heard of the disaster while in the midst of his own successes in Germany, and never pardoned Villeneuve. The latter, when liberated by the English, in April, 1806, returned to France, in hopes of justifying himself. He wrote to Paris, and then followed his letter, but received the answer of the Minister of Marine while on the road, which answer so overwhelmed him with mortification that he stabbed himself through the heart with a dagger.—*E. Shippen.*

Viol, or Voyol. A large messenger formerly used to assist in weighing an anchor by the capstan.

VIOL-, or VOYOL-BLOCK. A large single-sheaved block through which the messenger passed when the anchor was weighed by the fore or jeer capstan.

Virgiliæ. A denomination of the Pleiades.

Virgo, Constellation of (*Lat.* "The Virgin"). The sixth constellation of the ancient zodiac, lying between Leo and Libra. It contains a very brilliant star, *α Virginis*, called also *Spica*, which may be found by drawing a line from *Dubhe* through *Cor Caroli*, and producing it to a little more than the same distance; or it may be recognized as forming an equilateral triangle with Arcturus and β Leonis (Denebola), of which it is the southern angle.

Virgo, Sign of. The sixth sign of the ecliptic, including from 150° to 180° of longitude. Owing to the precession of the equinoxes, the *constellation* Virgo is no longer in the *sign* of this name, the constellation Leo having taken its place. The sun is in Virgo from about August 23 to about September 23. Symbol ♍.

Visible Horizon. See HORIZON.

Vis-viva. The product of the *mass* of a body multiplied by the *square of its velocity*. It is double the *actual energy* of the body, which is its *weight* multiplied by the square of its velocity and divided by $2g$. Expressed in formula, the notation of which is evident, $\frac{m v^2}{2} = \frac{W v^2}{2g}$.

Vitry. A kind of light, durable canvas.

Vivier. A French fishing-boat having a well amidships in which to keep the fish alive until arrival in port.

Vizy, or Vize. An old name for the muzzle-sight on a musket.

Voes. Arms or inlets of the sea, or sounds, in the Shetland and Orkney Isles. Also applied to creeks and bays.

Vogovans. From *voguer* and *avant*, chief rowers in the galleys.

Volans. See CONSTELLATION.

Volley. The simultaneous discharge of a number of fire-arms.

Volligue. A small boat used on the shores of Asia Minor.

Voluntary Stranding. The beaching or running a vessel purposely aground to escape greater danger; this act is treated as particular average loss, and not a damage to be made good by general contribution.

Voucher. A written document upon which any public account or charge is established.

Voyage. A journey by water, including both the outward and homeward voyages.

Vrach. Sea-weed used as fertilizing material.

Vulfe. A rapid whirlpool or race on the coast of Norway.

Vulgar Establishment of the Port. See TIDE.

Vulpecula. See CONSTELLATION.

W.

W. Abbreviation for *word* in the U. S. General Service Signal Code. In the log-book, *w* indicates *wet dew*.

Wad. A plug of hay, junk, etc., fitted to the bore of a gun, and placed over the shot in loading to keep it in place. *Grommet-wads* are simply rope grommets. *Junk-wads* are made of coiled junk. *Selvagee-wads* are made of rope-yarns, coiled up selvagee-fashion, and are only used with round shot.

WAD-HOOK. A worm (which see).

Wadmarel (*Eng.*). Coarse hairy cloth, used formerly in making pea-jackets.

Waffle-powder. A large-grained powder, designed by Commodore Jeffers.

Waft, Weft, or Wheft. A flag knotted or stopped in the middle is said to have a waft in it. This is a signal, used at the staff or half-way up to the gaff to show that a man is overboard; at the peak, a desire to communicate; at the mast-head, to recall boats, etc.

Wafter. A passage-boat.

Waftors (*Eng.*). Blunted swords for exercise. Certain officers appointed to guard the coast fisheries.

Wagering-policy, or Wager-policy. An insurance policy where there is no interest in ship or cargo. A kind of wager on the performance of the voyage.

Waggel. The young of the black-backed gull, *Larus marinus*.

Waghorn, Thomas. The feasibility of reviving a communication between Europe and India *via* the Red Sea having been established, this enterprising Bengal pilot took the lead in practically showing how much economy in time might be effected by the formation of a company that could equip steamers for the conveyance of mails and passengers to and fro. His scheme was carried out by an enterprising association, bringing Bengal 10,000 miles nearer to London. He was made a lieutenant in the royal navy, and received other rewards.

Waif. Derelict goods; goods not claimed.

Waist. That part of the ship between the quarter-deck and forecastle.

WAIST-ANCHOR. The anchor stowed in the waist; the sheet-anchor.

WAIST-BOARDS. Boards put in the waist to prevent the water from coming on board, especially in the gangways.

WAIST-BOAT. A boat carried in the waist.

WAIST-BLOCKS. *Chess-trees* in the waist.

WAIST-CLOTHS. The hammock cloths of the waist-nettings.

WAISTERS. Landsmen and worn-out seamen formerly stationed in the waist.

WAIST-NETTINGS. The boxes on the rail in the waist, in which hammocks are stowed.

WAIST-RAIL. The molding-rail in the waist.

WAIST-TREE. See ROUGH-TREE.

Wale-knot. A wall-knot.

Wales. *Main wales* are the strakes from the lower port-sill of the gun-deck to the bottom plank. *Channel-wales*, sometimes called strings, are those strakes between the spar- and main-deck ports in ships of three decks, and spar-deck ports in those of two decks. Middle wales are placed between the main- and gun-deck ports in ships of three decks.

WALE-PIECE. A piece of timber bolted horizontally along a dock, about the height of the wales of a ship, to serve as a fender.

WALE-REARED. Wall-sided.

Wales, Philip S., Surgeon-General U.S.N. Born February 27, 1837, in Annapolis, Md. After graduation at the University of Maryland, and a course of study in the Medical Department of the University of Pennsylvania, he settled at Baltimore, Md., whence he removed first to Philadelphia, Pa., and afterwards to Washington, D. C. Appointed assistant surgeon August 7, 1856; Naval Academy, 1857; steam-frigate "Mississippi," East India Squadron, 1858–60; steamer "Water-Witch," 1861. Commissioned as surgeon, October 12, 1861; naval hospital, Norfolk, 1863; steamer "Fort Jackson," North Atlantic Blockading Squadron, 1864, and same vessel, West Gulf Blockading Squadron, 1865; Examining Board, 1868; sloop "Portsmouth," South Atlantic Squadron, 1868–69; steam-sloop "Guerriere," European Station, 1870–72; member Board of Examiners, 1872–74. Commissioned as medical inspector, June 30, 1873; special duty, Washington, 1874–79. Surgeon-general and chief of the Bureau of Medicine and Surgery, with relative rank of commodore, January 26, 1880.

Surgeon-General Wales is a member of the Academy of Natural Sciences, the American Medical Association, and the Gynæcological Society of Boston. His contributions to medical literature comprise "Surgical Operations and Appliances," "A New Method of Controlling the Velum Palati," "A New Rectal Dilator and Explorer"; papers in the *American Journal of Medical Sciences* on "Cerebro-Spinal Meningitis," "Amputation of Shoulder-Joint," "Fracture of Lower Jaw," "Gunshot Wound of Stomach," "Ligature of the Femoral Artery," "Fracture of Thyroid Cartilage," "Operation for Hydropthalmia," and "Aneurism of the Heart"; a series of papers in the *Philadelphia Medical and Surgical Reporter* on "Instrumental Diagnosis," with a paper entitled "Description of a New Endoscope"; a paper in the *New York Medical Record* on "Traumatic Tetanus," and numerous reviews in various medical journals.

Walke, Henry, Rear-Admiral U.S.N. Born in Virginia, Princess Ann County, on Lyn

Haven River, Dec. 24, 1808. Appointed midshipman from Ohio, February 1, 1827; attached to receiving-ship "Alert," Norfolk, March 27, 1827; attached to "Natchez," West Indies, July, 1827; "Ontario," Mediterranean Station, February 8, 1829; frigate "Constellation," June 5, 1829; detached, November 16, 1831; Naval School at Norfolk, 1831–33.

Promoted to passed midshipman, June 10, 1833; "North Carolina," Pacific Station, November, 1836, to July, 1839; same ship in New York until October 5, 1840; "Boston," East Indies and around the world to August 8, 1843; brig "Bainbridge," Brazil, May 18, 1844, to September 17, 1845; bomb-brig "Vesuvius," West Indies, 1847; present at the surrender of Vera Cruz, Tabasco, Tuspan, and Alvarado; transferred to frigate "Mississippi"; frigate "Cumberland," Mediterranean Squadron, 1849–51.

Promoted to commander, Sept. 14, 1855; commanded the "Supply," coast of Africa, 1858–59, and in the West Indies, 1859–60. In the beginning of the Rebellion Commander Walke rendered most important service in preventing the capture of Fort Pickens by the Confederates, which enabled our forces ultimately to recapture the navy-yard, Forts Barrancas and McCrea, and Pensacola, with all that section of the State of Florida which borders on those extensive inland bays. He also rescued all our loyal officers, sailors, marines, and government employés from want and imprisonment. This service was performed under extraordinary difficulties and unusual circumstances, which compelled him to act contrary to the orders of the commodores on that station and the Secretary of the Navy; this conduct, although highly approved by all fair-minded officers, was censured by the Secretary of the Navy. The late Board of Rear-Admirals reported that it was especially struck with this highly creditable and meritorious conduct, and that it had a marked and important bearing on the success of our arms. Commander Walke was the senior naval officer present when this service was performed. Steamer "Mount Vernon," May 14, 1861; ordered as light-house inspector of 11th district, September 6, 1861, but orders changed to Mississippi Flotilla, September 6, 1861; commanded gunboat "Taylor," September 12, 1861, at Cairo, Ill.; commanded gunboats at the battle of Belmont, Nov. 7, 1861, and protected the army under Gen. Grant, and prevented the Confederate army from cutting off a portion of our troops on their retreat to the transports, for which he was highly commended in the general's report of the battle; commanded gunboat "Carondelet," 13 guns, partly ironclad, at the battle of Fort Henry, February 6, 1862,—the first decisive victory over the enemy's fortifications in the Western waters, for which Flag-Officer Foote and all his officers received the thanks of the Secretary of the Navy, of Congress, and of the State of Ohio; commanded the "Carondelet" at the battle of Fort Donelson, on the 13th, 14th, and 16th of February, 1862; commenced the battle alone on the 13th, and on the 14th held his position in the front line of battle in the general engagement, being the last to retire; the "Carondelet" was thrice as long under fire as any other gunboat in this battle of two days, and her loss in officers and men greatly exceeded that of all the rest of the flotilla; commanded the "Carondelet" at the bombardment of Island No. 10, March 17, 1862, and voluntarily ran the gauntlet of the enemy's batteries—April 4, 1862—with the "Carondelet" alone, being the first example of successfully passing the enemy's batteries and attacking them in the rear on the Mississippi, and finally captured the enemy's batteries below the island on the 6th and 7th (with but little assistance), without which no further attempt would have been made to capture or pass that island by our army and navy. This action was then considered the most important victory and meritorious achievement of the war, as it broke the blockade of the enemy's line of fortifications without the loss of a man on our side. The Secretary of the Navy referring to it wrote, "It was a daring and heroic act, well executed, and deserving a special recognition. These fearless acts dismayed the enemy, and eventuated in the surrender to yourself of Island No. 10; and that a nation's thanks were due, etc." These statements of the Secretary of the Navy were approved and indorsed by Flag-Officer Foote. May 11, 1862, Commander Walke led our fleet at the battle of Fort Pillow, with the first division of the flotilla attacked the enemy and rescued the gunboat "Cincinnati," the "Carondelet" being the first, or one of the first in, and the last out of the battle, and much longer under fire at close quarters than the rest of the fleet, and she remained alone in possession of the battle-field. In the battle of Memphis, June 6, 1872, the "Carondelet," under his command, was second in the line of battle with the flag-steamer when the fleet captured that of the enemy (except one gunboat and two which were sunk), with several of their largest steamers, also the navy-yard and all their public property, with the city of Memphis. The "Carondelet," still under his command, was the principal gunboat that engaged the famous Confederate ram "Arkansas," which was greatly her superior in size and strength, and after a well-contested battle the latter relinquished the contest, with the loss in killed and wounded greatly exceeding that of the "Carondelet."

Commissioned as a captain, July 16, 1862; commanded the ram "Lafayette" (partly clad with 1-inch iron); passed the batteries at Vicksburg, April 16, 1863, with the Mississippi Flotilla, under Rear-Admiral Porter. At the battle of Grand Gulf, April 29, 1863, he led the second division of our fleet, which, with the first, nearly silenced all the enemy's batteries at close quarters, being under fire more than 5 hours, when the fleet was withdrawn, and he was ordered back to silence the main fort, on the Point of Rocks, with the "Lafayette" alone, which he did in about 25 minutes. Having passed these forts three times under close fire, and having made the last attack upon them alone the day before they were evacuated, the "Lafayette" was under fire with that formidable chain of heavy batteries 8 or 9 hours, and much longer than the rest of the fleet, without the loss of any of her officers or crew, and but one officer slightly wounded, this being the seventh desperate and victorious battle, in which there was but 1 killed and 2 wounded under the command of Capt. Walke, whose vessels were always as much and generally more exposed to the fire of the enemy's guns, and as frequently struck by their

shot and shell at close quarters as any gunboat of the flotilla. And it is worthy of record that his officers and crew were always required to "remember to keep holy the Sabbath-day," according to our naval regulations. He dispersed the Confederates under Gen. Taylor at Simmsport, La.; blockaded the mouth of the Red River, June 4, 1863; ordered to the command of the steamer "Fort Jackson," July 24, 1863. Capt. Walke was the leader and one of the principal actors in all the above-mentioned actions, and for one or two of these Rear-Admirals Foote, Davis, and Porter were thanked and promoted. September 24, 1863, to August 22, 1865, he commanded the "Sacramento" on special service in search of the "Alabama," and was close on her track when she was sunk by the "Kearsarge." He blockaded the Confederate steamer "Rappahannock" at Calais, France, until the end of the war, and intercepted her when she escaped into British waters under British colors.

Commissioned as commodore, July 25, 1866; commanded the Naval Station at Mound City, Ill., May 1, 1868, to November, 1869.

Promoted rear-admiral, July 13, 1870. Retired voluntarily, April 26, 1871; member Light-House Board, 1871–72. Rear-Admiral Walke's services were equal, if not superior, to those of any other officer of the navy with the forces under his command.

Wall-knot. See Knot.

Wall-piece. An old heavy musket.

Wall-sided. Having sides nearly perpendicular.

Walrus. An aquatic mammal, the *Trichechus rosmarus*, allied to the seals, with long canine teeth. Its flesh is good for food, and its skin and tusks are valuable.

Walt (*Eng.*). An old word for crank, or tottering.

Walty. Crank.

Wane (*Eng.*). Deficiency in timber; want of squareness at the corners.

Wane-cloud. Cirro-stratus.

Wangan. A provision-boat, used in Maine.

Wany. Tapering or uneven; spoiled by wet, as timber.

Wapp, or Whap. Formerly, any short pendant or thimble, through which running rigging was rove. A rope connecting the shroud to the laniard; a kind of stopper for the shroud with wall-knots in it.

War-caperer. A privateer.

Wardroom. The apartments of the commissioned officers, including mess- and state-rooms. It is on the berth-deck of frigates and sloops, but was on the gun-deck of line-of-battle ships.

Wardroom-country. The open space between the state-rooms in the wardroom.

Wardroom-officers. Commissioned officers messing in the wardroom. All commissioned officers in the U. S. navy are wardroom-officers, except those ranking with ensign. When an ensign, or an officer having the equivalent rank, is a watch-officer or the head of a department, he is a wardroom-officer.

Ware. See Wear.

Warehousing. Placing goods in bonded warehouses until cleared.

Warm-sided. Mounting many heavy guns.

Warner (*Eng.*). A beacon, buoy, light, etc., to warn vessels of dangers. A sentinel formerly placed on heights to give notice of the approach of vessels.

Warning-lights. Flash-lights, burned in case of emergency, to warn vessels of danger, etc.

Warning-signal (*Eng.*). A signal hoisted to warn vessels not to cross a bar. A storm-signal.

Warp. A tow-rope or light hawser, used to move a ship about. (*Eng.*) A term for four herrings. Land between sea-banks and the sea. A given length of rope, rope-yarns, etc. The threads along the length of canvas. *Shroud-warp*, the length from which shrouds are to be cut. *To warp*, to move a vessel with warps, or lines, fast to fixed points. To stretch rope-yarns into fixed lengths for tarring. (*Eng.*) To flood land near rivers.

Warpage. A charge per ton for warping ships.

Warping-block. A large block used in making warps in rope-walks.

Warping-chock. A large chock placed in a port to lead hawsers through, in warping.

Warping-hook. A hook used by rope-makers for hanging the rope on, in warping yarns.

Warping-post. A strong post in a rope-walk, used in warping yarns.

Warrant. An instrument conferring authority upon persons, inferior to a *commission*. A writ issued by an inferior power, as by the Secretary of the Navy. A document assembling a court-martial, court of inquiry, etc. *Dock-warrant*, a custom-house license or authority. *Press-warrant*, a warrant formerly issued giving power to press seamen. *Brown-paper warrants* (*Eng.*), those given by a captain, and revokable by him. *Acting warrant*, a warrant given by a commander-in-chief, or by the Secretary, to a person temporarily chosen to fill a warrant office.

Warrant-officer. An officer holding his position by virtue of a warrant issued by some power inferior to the supreme magistrate, as by a navy board, the Secretary of the Navy, etc. *Warrant-officers* are selected or promoted from seamen, ship-carpenters, etc., and comprise the boatswain, gunner, carpenter, and sailmaker. They receive at sea, in the U. S. navy, from 1200 to 1800 dollars per year, according to length of service. They rank next below mates, and are quartered and messed separately. Formerly their rooms were forward, and they were then called *forward officers*, but this name is no longer used.

Warranty. A contract or clause in marine insurance policies, engaging that certain things affecting the risk shall be done, or shall exist, etc. Certain warranties are implied in all instruments.

Warren, Sir J. Borlase. After a lengthened service in a subordinate grade, this excellent officer was fortunate enough to capture a French line-of-battle ship and 3 frigates, and thus gained promotion to the rank of admiral. In 1812, during the war between England and the United States, Sir J. B. Warren was employed on the eastern coast of America, and likewise visited the West India Islands.

Warren-head (*Eng.*). A dam across a river.

War-ship, or War-vessel. A vessel built to engage in war; a national ship, armed and equipped for war.

Warth (*Eng.*). A ford.

Wash. Accumulated silt in river mouths.

Flooded banks or sands. A shallow inlet or gulf. The blade of an oar. (*Eng.*) A Billingsgate oyster-measure, two-thirds of a bushel. *Awash*, even with the water's edge.

Wash-board, or Wash-strake. Broad, thin plank fastened on the gunwale of a boat or small vessel, to keep the spray out. Boards fitted to the sills of lower-deck ports of a liner. The white facings of old naval uniforms.

Wash-clothes. The clothes that have been washed and hung on the clothes-lines to dry.

Wash-deck Gear. The brooms, squilgees, holy-stones, buckets, etc., used in washing decks.

Washer. A ring or plate of metal, leather, gum, or other material suitable to the purpose intended, placed under a bolt-head or nut, either for distributing the strain of the bolt over a greater area than that of the face of the nut, relieving the friction of turning the nut, or rendering the junction tight. A loose ring placed between the hub of a wheel or gun-truck and the linchpin. A ring of leather or gum placed between hose-couplings to prevent leakage.

Washington, the capital of the United States, is finely located on the Potomac River, in the District of Columbia. Lat. (of Observatory) 38° 53′ 9″ N., lon. 77° 2′ 48″ W., from Greenwich. That portion of the American ephemeris which is designed exclusively for astronomical use, is adapted to the meridian of Washington, and American maps are frequently constructed with this meridian as the origin whence longitudes are reckoned. The city is situated between two small tributaries of the Potomac, the one on the east called the East Branch, and the one on the west called Rock Creek. In addition to its being the seat of the national government, and containing all the Department buildings, it is also the seat of the U. S. Naval Observatory, one of the institutions most creditable to the government, occupying a commanding site on the banks of the Potomac southwest of the President's mansion. The arsenal on Greenleaf's Point, at the junction of the East Branch with the Potomac, is one of the principal establishments of its kind in the United States. About 1¼ miles northeast from the arsenal on the East Branch is the navy-yard. (See Navy-Yard, Washington, D. C.) The government asylum for insane soldiers and sailors, and the Soldiers' Home for disabled soldiers, are also located here. Pop. 160,000.

Wash-water (*Eng.*). A ford.

Waste. Material which cannot be utilized for the purpose for which it was intended. *Cotton-waste* is the portion of yarn that will not unwind from the bobbins of cotton machinery. It is used for wiping oil and dirt from machinery, to which purpose it is better adapted than any other substance.

Waste-board. See Wash-board.

Waste-steam. Steam that escapes from the safety-valve of a steam-boiler, or leaks through the joints, valves, or pistons of a steam-engine.

Waste-steam Pipe. A pipe for conducting superfluous steam from a steam-boiler or other apparatus to some convenient point.

Waste-water Pipe. A pipe for discharging superfluous water from a reservoir of any kind.

Watch. The part of a ship's company that work her for an allotted time. The crew is generally divided into the starboard and port watches, but it may also be divided into three watches, as is at times customary with the firemen. The watch are not required to keep their feet, or even to keep awake, but must be ready for a call, and cannot go below-decks. They are mustered at the beginning of, and often during, the watch, by a midshipman, or other junior officer, or by the captains of the parts of the ship. Both watches, or *all hands*, are called at any time in a sudden emergency, when the executive-officer takes charge of them. The watch is *set* at 8 o'clock each evening, and the relief watch is called generally ten minutes before 12, 4, etc. The watches go to meals separately, except in fair weather, under steam alone, when both may go. With each watch is a boatswain's mates, one or two quarter-masters, one or two quarter-gunners, a carpenter's mate, and a ship's corporal. The marines are also watched, in connection with their sentry-duty, and assist in working ship. The officers of the line (and engineers when steaming) are also divided into watches, and the lieutenants have charge of the watch, the midshipmen and mates being junior officers, stationed on the forecastle or quarter-deck. The first and second lieutenants, and staff-officers, warrant-officers, many petty officers, cooks, stewards, etc., are not watched, and mechanics, etc., are only watched at night. *Watch and watch*, the usual arrangement in two watches, alternating in duty. *Anchor-watch*, a detail of men, or a quarter-watch kept when the ship is at single anchor. *Quarter-watch*, one-fourth the working hands,—half of each watch. The watch is divided into first and second parts, and these comprise the quarter-watches. *To relieve the watch*, to formally shift watches, after the new watch is on deck.

The length of time into which the day is divided, or the time one watch remains on deck. *First watch*, from 8 P.M. till midnight. *Middle-watch*, or *mid-watch*, from midnight until 4 A.M. *Morning-watch*, from 4 to 8 A.M. *Forenoon-watch*, from 8 to 12 M. *Afternoon-watch*, from 12 M. to 4 P.M. *Dog-watches*, two watches of two hours' length: *first dog*, from 4 to 6 P.M.; *second dog*, from 6 to 8 P.M. These are necessary for shifting the two watches, so as to give each a turn of 8 hours below at night. There are no dog-watches in the French service, and instead, there are two 6-hour watches. *Port- or harbor-watch*, an arrangement of the officers' watches, by which, when in port, two remain on duty at a time, alternating the watches. By the usual arrangement of the officers' watches at sea, they follow each other in succession. A buoy *watches* when it floats properly on the surface. *Watch ho, watch!* a warning-cry used in heaving the deep-sea lead, to indicate that the line is running out, and to warn the next person holding it. *To watch a smooth*, to look out for a smooth sea before putting the helm down. *To watch the crew*, to arrange them in watches.

Watch-bell. A small bell sometimes used in night-watches instead of the larger ship's bell.

Watch-bill. The list of the crew divided into watches. It is generally in connection with the quarter-bill and the station-bill. See Watch-, Quarter-, and Station-bill.

Watch-glass. A half-hour glass, formerly used to indicate time during the watches.

Watch-gun. A gun sometimes fired at 8 o'clock, on *setting* the watch.

Watch-officer. From three to five officers, of the grade of lieutenant-commander, lieutenant, master, or ensign, are ordered to each vessel as watch-officers. Lieutenant-commanders have been seldom assigned to this duty since the reduction in the number of officers in that grade, and ensigns are sent to the smallest vessels only.

The watch-officer, while on duty, is the representative of the commanding officer, and his authority is subject only to that of the commanding and executive-officers. He executes all orders received from the commanding and executive-officers, and must conform, in his manner of carrying on duty, to the regulations and to the customs of the service.

On taking charge of the deck, he informs himself of the position of the ship in regard to all dangers, as shoals, rocks, land, other vessels, etc. Throughout his watch he pays strict attention to the steering and logging, and is careful to insert in the log-book the various facts and data required by the instructions in the regulations. He reports to the commanding officer all facts of special interest, such as the making of land, or of a sail or light. He should never, on his own authority, carry sail beyond the limits of prudence. He sees that the etiquette of the quarter-deck is observed, attends all commissioned officers as they leave the ship, and receives them when they come on board. During his watch he is responsible for the proper management of the ship under all circumstances, and for the discipline of the crew. On his judgment frequently depends the safety of the ship, and he should, therefore, be prepared to meet any emergency that may arise, such as a squall, fire, collision, etc.

An officer's value is better shown in avoiding difficulties than in extricating himself from them. If the subordinate officers and look-outs are kept on the alert, and the instructions concerning the running-lights, fog-signals, etc., are strictly enforced, collisions will be of rare occurrence. If the corporal of the guard and master-at-arms are thorough in their inspections, a fire can make but little headway before discovered.

And so in regard to emergencies in general, it may be observed that they can be avoided ordinarily by timely precautions. In case an emergency does occur, there are two qualities which are necessary to an officer to carry him through creditably,—*i.e.*, *coolness* and *common sense*. Common sense cannot be acquired,—it is a natural gift. Coolness is born of confidence, and confidence is inspired by experience; of this latter article, the watch-officer of to-day is likely to have a surfeit.

Watch-, Quarter-, and Station-bill. Bills or lists of the crew, with their stations, etc., at guns and on the yards, prepared by the executive-officer, and posted so that the crew may see them. The bills in the U. S. navy are now uniform for all ships, and consist of several parts. A general description of the vessel and of her engines is first given. Next a description of her battery, of the capacity of magazines, shell-rooms, and of the powder-tanks, and the number of small-arms. A diagram of the vessel follows, then a description of the boats, of the life-rafts, life-preservers, pumps and hose, and of the capacity of the water-tanks. The dimensions of spars and the sail-areas follow, then the anchors, chains and hawsers, and the spare spars and sails. A list of the officers, the complement of the crew, and the force-bill terminate this preliminary portion.

Next comes the *watch-bill*. The crew are divided into several parts, aside from the main division into two watches, viz., forecastle, foretop, main-top, mizzen-top, and after-guard, each consisting of first and second parts, and petty officers, watched messengers, idlers, mechanics, engineer's force, marines, and bandsmen. Each man's name is written, with his rate or rank, opposite a number, odd numbers in the starboard, even in the port watch, beginning with 1, and opposite his name is also written, in appropriate columns, his gun or division, boat, company, mess, and his station at loosing and furling sails. The *engineer's watch-bill* gives a list of the men, their watch- and engine-room numbers, and their rates. The watch-bill is terminated by a description of the manner of stowing hammocks, and diagrams of the decks, showing the berthing arrangements.

Then follows the *quarter-bill*. This gives a list of the men, with their watch-numbers, rates, ship's- or paymaster's-numbers, gun-numbers, and stations at the guns, together with the quarter-gunners and officers of divisions. From 3 to 5 guns constitute a division, and sometimes a pivot-gun on the upper deck is in a division by itself. Following the gun-division are the navigators' division, comprising those men who work and steer the ship during action, the powder-division, to furnish powder, shot, and shell to the guns, the marine-guard, and the surgeon's and the paymaster's divisions. A list is then given of the boarders, of the riflemen, of the firemen, pumpmen, and sail-trimmers. A list of stations at torpedo-exercise and the fire-bill follow, and terminate the quarter-bill. A list is then given of the life-boats' crews, detailing them, with their duties, in each watch. Then follow the boats' crews, both for ordinary work and for equipping for action, and with the station of each person in abandoning the ship, in case of wreck. Each man's duty, and the articles he shall furnish in providing the boat, are prescribed. The battalion organization then follows, giving each company and howitzer crew, with its place in the battalion.

The concluding portion of the book is the *station-bill*, giving the officers' stations, diagrams of the spars, with the position of each looser and furler, and the detailed station of each man in the crew for the various evolutions of loosing sail, furling sail, bending sail, sending up and down light yards, housing and fidding topmasts, sending up and down topsail-yards and lower-yards, hoisting out and in boats, mooring and unmooring, making sail and getting under way, setting and taking in stun'-sails, tacking and wearing, reefing topsails and courses, shortening sail and anchoring, manning yards and clearing ship for action. The *combination-bill* shows the duties of each one of the crew in all these evolutions at a glance. Details are then given for preparing ship for sea, cleaning ship, spreading and furling awnings, and stopping on scrubbed hammocks. The routines of divisional exercises, and of spar- and sail-drills for each day, and a monthly, half-monthly, and daily routine, complete the bills. See Routine.

Watchet (*Eng.*). Light blue cloth formerly worn by sailors.

Watch-tackle. See TACKLE.

Water. The drinking water for use on shipboard was formerly kept in casks, stowed in several tiers, the lowest being the *ground-*, the others the *riding-tiers.* More recently, iron tanks, fitted to the form of the ship, and placed in the hold, have been used. Later, iron ships have had hollow masts, so that water may be carried in them. Fresh water is now distilled from *sea-water*, by distilling apparatus, in steamers, and in some sailing-vessels, and thus purer water is insured. One ton of coal should distill 7 tons of fresh water. Each man is allowed 1 gallon of water per diem. Water, before being received on board, must be tested by the medical officer, for impurities, and should not be received until passed by him. Fresh water is only used on shipboard for drinking and culinary purposes, by the crew, and occasionally, paint-work is scrubbed with fresh water. *To make water*, to leak. *To water ship*, to take a supply of water on board. This is done by filling the large casks, and emptying them afterwards, by filling the launch in fresh water and towing her off, or through the medium of a *water-boat*, or hydrant.

WATER-ANCHOR. See SEA-ANCHOR.

WATER-BAILIFF (*Eng.*). An officer who searches vessels for suspected persons and goods, etc.

WATER-BALLAST. Water used to ballast a ship or boat. When the tanks are emptied of fresh water, it is sometimes necessary to let salt water run into them, to be used as ballast. Some English colliers have large tanks below the coal-bunkers, to be filled when the latter are emptied, with salt water, as ballast.

WATER-BARK. A Danish water-boat.

WATER-BATTERY. A battery nearly on a level with the water.

WATER-BEWITCHED DRINKS (*Eng.*). Tea, *geograffy*, 5-water grog, and other diluted drinks.

WATER-BOARD. A board set up to windward in a boat to keep the water out.

WATER-BOAT. A boat containing a large tank, filled with fresh water, and having steam- or hand-pumps for conveying it into ships. A boat filled with water in bulk or in casks, for ship's use.

WATER-BORNE. Floating on the water. A ship is water-borne when she is just off the ground.

WATER-BRIDGE. In steam-boilers, a hollow bridge-wall, of metal, filled with water having circulation with the water contained in the boiler.

WATER-BUTT. A large water-cask. See WATER-CASKS.

WATER-CAP. A cap in a navy time-fuze, to prevent the water from entering and extinguishing the fuze.

WATER-CASKS. Casks for storing or bringing water to a ship. The following sizes of casks, with their weights when full, embrace those most in use:

Butt—110 gallons, weight 1100 pounds.

Puncheon—72 gallons, weight 720 pounds.

Barrel—36 gallons, weight 360 pounds.

Cask or kilderkin—18 gallons, weight 180 pounds.

Small casks for use in boats, about decks, etc., are called *breakers.*

WATER-CONDENSER, or WATER-DISTILLER. See DISTILLING APPARATUS.

WATER-CRAFT. All vessels plying on the water.

WATER-CROW. The shag, or lesser cormorant.

WATER-DOG. A sea-dog; an old sailor.

WATER-FLEAS. The *Entomostraca*, a group of crustacea of the genera *Cyclops* and *Daphnia.*

WATER-FOX. The carp; so called on account of its cunning.

WATER-GALL. A name for the *wind-gall.*

WATER-GAUGE. A sea-wall. An instrument to measure the rise of water. A gauge which indicates the quantity or height of level of water within a chamber or reservoir, such as a steam-boiler, etc. An instrument for indicating pressure by means of a column of water.

WATER-GAVEL (*Eng.*). Rent paid for fishing-rights in a stream.

WATER-GUARD. A custom-house officer employed to watch incoming vessels, or those passing out.

WATER-HEMLOCK. The *Œnanthe crocata*, a poisonous aquatic plant.

WATER-HORSE. Codfish stacked in a pile to drain.

WATERING-PLACE. A locality where fresh water may be procured for ships' use.

WATER-LAID ROPE. Rope laid up against the sun, or left-handed.

WATER-LEG. A space in a marine boiler between the furnaces, filled with water.

WATER-LINES. Horizontal lines supposed to be described by the surface of the water on the bottom or sides of a ship, and which are exhibited at certain parallel depths upon the sheer-plan. Of these the most important are the *light water-line* and the *load water-line.* The light water-line is the line of immersion of the ship when light or unladen. The load-water line is the line described around the ship's body when the cargo is all on board and the ship is ready for sea. In the half-breadth plan the water-lines are outward curves, limiting the half-breadth of the ship at the same height as the corresponding lines in the sheer and body plans.

WATER-LINE MODEL. A model made up from horizontal or water-lines and the sheer-lines.

WATER-LOGGED. The condition of a leaky ship when she is so full of water as to be heavy and unmanageable.

WATERMAN. A man who plies for hire on the water; a boatman.

WATERMAN'S-KNOT. A name for the *clove-hitch.*

WATER-MARK. A mark on a water-gauge indicating the height of water.

WATER-PADS. River-pirates; water-thieves.

WATER-PLOW. A kind of dredging-machine formerly used in rivers.

WATER-ROOM. The space in a steam-boiler that is filled with water.

WATER-SAIL. A small sail set under the lower studding-sail. A sail formerly set under a projecting spanker-boom, extending to the water's edge.

WATER-SCAPE. A passage for water

WATER-SHELL. A shell invented by Abel, filled with water, and containing gun-cotton in a cylinder in the centre.

WATER-SHOT. That condition of a ship

moored neither across tide nor up and down, but midway between the two positions.

WATER-SKY. A dark blue sky caused by reflection of deep water, seen in Arctic seas.

WATER-SNAKES. The marine snakes of the genus *Hydrophis*, with broad flat tails.

WATER-SPACE. The space occupied by the water in a marine boiler.

WATER-SPOUT. A vertical column of water moving along the surface of the sea, having also a gyratory motion. As considerable masses of water are raised, they are dangerous to small ships. They may be broken by firing into them.

WATER-STANG. A pole across a stream.

WATER-STOUP (*Eng.*). The periwinkle.

WATER-TANK. See TANK.

WATER-TIGHT. Well calked; staunch. Not admitting water.

WATER-TUBE BOILER. A steam-boiler in which the tubes are so arranged that the water is *within* the tubes around which the heat circulates.

WATER-WAR (*Eng.*). The *bore* of the Severn.

WATER-WAYS. Pieces of oak or yellow pine timber lying in the angle made by the top of the deck-beams and inside of the frame-timbers.

WATER-WITCH. The *dipper*, a sea-bird.

WATER-WRAITH. Supposed sea-spirits in the Shetland Islands.

Waterford, the capital of Waterford County, Ireland, on the right bank of the Suir, which forms its harbor, and is lined by a fine quay about 1 mile in length; 9 miles from the sea. Among the principal buildings are the chamber of commerce, custom-house, and artillery barracks. The city is the entrepôt for a large extent of country, the exports of which are bacon, live-stock, dairy and agricultural produce, salmon, and cotton goods. It has two large ship-building yards, and manufactories of glass and starch, with distilleries and breweries. Pop. 24,000.

Waters, Captain Daniel. In January, 1776, Capt. Waters was appointed to the schooner "Lee," of eight 6-pounders. While commanding her he captured or assisted in capturing several valuable transports, in one of which was Col. Campbell, with a part of the 71st British regiment; in another a quantity of merchandise which the British had plundered from the merchants of Boston when they evacuated that city. In command of the privateer "Thorn" of 16 guns, of Boston, Capt. Waters, in the year 1778, engaged the "Governor Tryon" of 16 guns, Capt. Stebbins, and the "Sir William Erskine" of 18 guns, Capt. Hamilton, each having a greater number of men than the "Thorn." The action lasted for two hours, when the "Tryon" struck, and the "Erskine" made sail to escape. The "Thorn" pursued her, and compelled her to strike. Capt. Hamilton and the other officers of the "Erskine" were removed on board the "Thorn," and the "Erskine" was ordered to follow in pursuit of the "Tryon," which vessel, however, escaped, owing to the darkness of the night. The next morning the "Erskine" was manned and ordered for Boston, leaving the "Thorn" about 60 men only. A few days after this the "Thorn" fell in with the "Sparlin" of 18 guns and 97 men, and after a close action of nearly an hour the "Sparlin" struck. The "Thorn" and her two prizes arrived safe in Boston. Capt. Waters was appointed by Congress a captain of the navy, March 15, 1777, upon the recommendation of Gen. Washington, by whom he had been employed, and who wrote of him in terms of high approbation.

Wattles. Bristles near the mouths of certain fish.

Wave. A volume of water raised by the action of the wind, tide, or current, upon the ocean. Waves may arise from no apparent cause, as when they precede or follow a storm. Waves are either *natural*—that is, proportioned in size to the strength of the producing force—or *accidental*, being increased or diminished by collision with other waves, concussion with intervening bodies, etc. *Simple waves* are those proceeding directly from the producing causes, without interruption in any direction, and unaccompanied by any other waves. *Compound waves* occur when several producing causes have resulted in waves of different heights, etc., as in a confused or chopping sea. So when certain waves occur, greater than the majority in the same locality, it is due to a greater cause, or to their coming from a shorter distance. Waves are in section cycloidal curves. They do not probably extend more than 2000 yards below the surface, and the effect of generating causes is less the farther you recede from the surface.

Dimensions and velocity of waves.—The velocity of waves is dependent on their length. If length (l) is known, the velocity is that that a body would acquire in falling through a height equal to $\frac{1}{2} r$, where r is the radius of a circle whose circumference equals l. This would give as a mathematical expression $v = \sqrt{\frac{l g}{2 \pi}}$. Where g is the force of gravity, and π the quantity 3.1415, etc., g may be taken as $16\frac{1}{12}$. This would then reduce to $v = \sqrt{l \frac{193}{75.396}}$. But as waves approach a shelving shore their lengths decrease, but they become higher, while their lower part decreases in velocity on account of friction, and thus they break into *surf* when their height equals the depth of the water. Dr. Scoresby, in 1850, measured Atlantic waves, finding some 43 feet high from trough to crest. Other waves in 100 feet of water were 4 to 5 feet in height, and 30 to 40 feet long, but did not extend to the bottom. He found the mean height of Atlantic waves to be 10 feet. Six hundred feet in breadth, from crest to crest, is usual in waves 30 feet high, and with a velocity of 32 miles per hour. Northwest gales caused waves off Cape Horn 40 feet high, but only 32 feet off Cape of Good Hope. *Tidal waves* are caused by the regular fluctuations of the tides. An earthquake is often accompanied by a wave, that of Lisbon being some 40 feet in height, and that at Arica, more than 50 feet high.

WAVE-LINE. A method of shaping the hull of a vessel, invented by Scott Russell, in which the lines of the vessel were cycloidal, or approaching that curve in character.

WAVESON. Goods found floating on the waves after shipwreck.

Way. The progress of a ship through the water. *Head-way*, motion ahead. *Stern-way*, motion astern. *Fresh-way*, increased motion from any cause. *To be under way*, to be in mo-

tion. *To have way*, to have motion through the water. *To gather way*, to acquire motion through the water. *To lose way*, to cease moving. See LEE-WAY.

GETTING UNDER WAY. The manœuvre by which a vessel is released from the restraint of anchors and cables and placed under the control of its motive-power.

The manner of performing the evolution may differ with the force and direction of wind, tide, or current, rig of vessel, motive-power, whether steam or sail, and the berth in which the vessel may be anchored.

Except when fixed moorings are employed, the anchor or anchors are hove up by means of the capstan, windlass, or deck-tackle.

When great haste is necessary the cable may be slipped by unshackling it as near the hawse-pipe as possible, and allowing that part connected with the anchor to go overboard, having first attached a buoy by which it can be easily recovered.

With a vessel under steam the evolution is the most simple, as she is to a great extent independent of both wind and tide. The anchor being aweigh, the engine is started, and the vessel is at once under the control of the machinery and helm.

When sail-power alone is used, the operation is more difficult, as the direction and force of wind and current must be regarded, and also the proximity of dangers or of other vessels. The cable is hove in to a short stay when sail is m[illegible]d, in the case of a square-rigged vessel, t[illegible] are braced in such a manner as to as-s[illegible]iving the required direction and head-[illegible]he vessel after the anchor is aweigh; [illegible] can only be determined by the action of [illegible]ind and current upon the vessel, their relat[illegible] strength, and the direction in which it is nec[illegible]sary that the vessel should move. The anchor is then hove up, the head-sails hoisted when the anchor is aweigh, the helm used as required to bring the vessel on her course, and the yards are trimmed as may be necessary.

The time at which the square-sails should be set may depend upon the direction of the wind with the desired course of the vessel; for if that course will bring the wind well aft, the anchor is first weighed, the vessel turned in the required direction by means of the head-sails and helm, and all sail made when she is upon her course.

With a fore-and-aft-rigged vessel the process is similar, but it is more simple on account of the advantages of rig.

To get under way from fixed moorings the cable which is shackled to the buoy is replaced by a slip-rope, which is let go at the proper moment and the delay of heaving up the anchor is avoided. In a crowded harbor it may be neces-[illegible]ary to heave up the anchor and warp the vessel [illegible]lear of others before proceeding to make sail, or [illegible] the vessel is anchored in the vicinity of dangers, a part of the manœuvre may consist in taking a temporary berth by using a kedge.—*E. T. Strong, Lieutenant U.S.N.*

Way-gate. The tail-race of a mill.

Ways. See SHIP, LAUNCHING OF.

Weak-fish. A fish of the genus *Otolithus* (*O. regalis*).

Weal (*Eng.*). A wicker-basket for catching eels.

Wear. A weir. To put a ship on the other tack by turning her bow away from the wind. *Wear* is more generally used than *veer* in this sense.

Weather. To sail to windward of. *To weather a ship*, to get to windward of her; to sustain the effects of the weather. *To weather a gale*, to come out of a storm safely. *To weather the cape*, figuratively, to become skilled. *To weather difficulties*, to contend with and surmount difficulties. *Weather side*, the side next to the wind.

The air or atmosphere, with respect to its state of dryness or moisture, heat or cold, clearness or cloudiness, or any other physical state; as, dry, cold, wet, hot, warm, calm, pleasant, windy, squally, fair, foul, stormy, rainy, cloudy, clear weather. *Stress of weather*, tempestuous weather, violent winds. The following notation is used by seamen to indicate states of the weather, in the log-book:

Beaufort Weather Notation.

b. Blue sky.
c. Clouds (detached).
d. Drizzling rain.
f. Foggy.
g. Gloomy.
h. Hail.
l. Lightning.
m. Misty.
o. Overcast.
p. Passing showers.
q. Squally.
r. Rainy.
s. Snow.
t. Thunder.
u. Ugly, threatening.
v. Visibility, clearness.
w. Wet dew.

A bar (—) under any letter augments its signification, and a bar and a dot ∸ indicates heavy and continuous weather of the kind denoted.

WEATHER-ANCHOR. The anchor laid out to windward, by which the ship will ride, when tides permit.

WEATHER-BITT. To take an extra turn of the cable about the bitts in bad weather. See BITTS.

WEATHER-BOARD. The side of the ship to windward. Planks placed in the ports of a ship in ordinary, inclined so that the water may run off.

WEATHER-BORNE. Oppressed by wind and sea.

WEATHER-BOUND. Detained by wind or sea.

WEATHER-BREEDERS. Wind-dogs, fog-dogs, and other indications of bad weather.

WEATHER-CLOTH. A covering for the hammocks, boats, etc., of painted canvas. A tarpaulin, placed in the weather rigging, to shield the men and officers on watch.

WEATHER-COIL (*Eng.*). The position of the ship when she has been reversed so as to head opposite to her former course, either by a shift of wind, or by the helm, or swell in calm weather. To resume the course when taken aback, by making a stern-board and backing around.

WEATHER-EYE. A figurative term, "*Keep your weather-eye open*"; be on your guard.

WEATHER-GAGE, or WEATHER-GAUGE. The position of a ship to windward of another,—a position of great advantage in the days of sailing-ships, but not so much so now.

WEATHER-GALL. See WIND-GALL.

WEATHER-GLASS. The barometer.

WEATHER-GLEAM. A clear sky near the horizon after stormy weather.

WEATHER-GO. The end of a rainbow in the morning.

WEATHER-HEAD. A secondary rainbow.

WEATHER-HELM. See HELM.

WEATHER-LURCH. A sudden and heavy roll to windward.

Weatherly. Holding a good wind, and making little leeway; working well to windward.

Weathermost. The farthest to windward.

Weather-rhymes. Seamen find it convenient to express many important facts in these rhymes, and a few of the more prominent are here given:

> "A weather-gall at morn,
> Fine weather all gone."

> "A rainbow (*or* red sky) in the morning,
> Sailors take warning;
> A rainbow (*or* red sky) at night
> Is the sailor's delight."

> "The evening gray and the morning red,
> Put on your hat or you'll wet your head."

> "When the wind shifts against the sun,
> Trust it not, for back it will run."

> "When the sun sets in a clear,
> An easterly wind you need not fear."

> "The evening red and morning gray
> Are sure signs of a fine day;
> But the evening gray and morning red
> Make the sailor shake his head."

> "With the rain before the wind,
> Your topsail halliards you must mind;
> But when the wind's before the rain,
> You may hoist your topsails up again."

Or

> "When rain comes before wind,
> Halliards, sheets, and braces mind;
> When wind comes before rain,
> Soon you may make sail again."

> "First rise after very low
> Indicates a stronger blow."

Or,

> "When rise begins after low,
> Squalls expect and clear blow."

> "Long foretold, long last,
> Short notice, soon past."

> "When the glass falls low
> Prepare for a blow;
> When it rises high
> Let all your kites fly."

> "Mackerel sky and mares' tails
> Make tall ships carry low sails."

Weather-roll. The roll of a ship to windward.

Weather-rope. An old term for *tarred rope*.

Weather-shore. A shore to windward of the ship.

Weather-side. The side toward the wind. At sea, the weather-side is the *royal* side,—that is, the weather gangway is not a loafing-place. The weather side of the quarter-deck is for the officer of the deck, captain, and executive-officer only, and the weather-side of the gun-deck is kept clear.

Weather-tide. A tide running toward the wind.

Weather-wheel. The helmsman on the weather-side of the wheel.

Weaver. A fish of the perch family; the *Trachinus vipera*.

Wedding-knot. A crossed seizing between two eyes in ropes.

Wedge. *Mast-wedges*, wedges placed about the mast in the partners, for confining it in place. *Launching-wedges*, wedges used to lift a ship in launching. *Set-wedge*, a wedge used to drive together two timbers.

Wedge-fid. A fid in two parts, wedge-shaped.

Weed. To clear rigging, etc., of rope-yarns.

Weel. A baited basket-trap for catching fish.

Weep. To ooze in small quantities, as the water from the side of a ship.

Weever. See Weaver.

Weevil. The *Curculio*, a variety of which is very destructive to bread, rice, etc.

Weft. See Waft.

Weigh. *To weigh anchor*, to lift the anchor from the bottom.

Weighage. A charge for weighing goods at a dock.

Weight-nails. Nails of great size, larger than deck-nails, with flat heads.

Weight of Metal. The weight of iron that a ship can throw at one round from all her guns. A line-of-battle ship, mounting 74 guns, would have thrown but 1570 pounds of metal 200 years ago, but the recent frigates, such as the "Alexandra," throw upwards of 4000 pounds, and the Italian "Duilio" will throw at a round 8000 pounds of metal.

Weir. An old term for sea-weed. An inclosure in which fish are caught. A dam across a river.

Well. An inclosure from the hold to the lower deck, protecting the pump from injury. An aperture in the upper-works of the stern of a steamer, for the propeller to travel in. A compartment in a fishing-vessel in whi[f a circ] circulates; in this fish are preserved alive[ould giv] synonymous with *belay*. *To well off*, to [...] leak by surrounding it with a temporary [...] well, carried above the water-line.

Well-boat. A fishing-boat provided [...] a well.

Well-cabin. A cabin in a small vessel entered from above, with no ports or ventilation from the sides.

Well Fare Ye! (*Eng.*). An expression formerly used to encourage the men at heavy heaving.

Well-found. Fully provided or equipped.

Wells, Clark H., Commodore U.S.N. Born in Reading, Pa., September 22, 1822. Appointed midshipman from Pennsylvania, September 25, 1840; attached to the line-of-battle ship "North Carolina," 1840; frigate "Brandywine" and sloop "Fairfield," Mediterranean Station, 1840–41; razee "Independence," Home Squadron, 1842–43; sloop "Levant," Pacific Station, 1844–45; Naval School, Annapolis, Md., 1846.

Graduated and became a passed midshipman, July 11, 1846; during the Mexican war, attached to the brig "Somers," blockading Vera Cruz, in 1846, and to gunboat "Petrel," 1846–47, during which time the latter vessel was one of Tattnall's flotilla in the attack upon the Castle of San Juan de Ulloa and the city of Vera Cruz; took part also in the capture of Tuspan and Tampico; to the East Indies, and around the world in sloop "Plymouth" and brig "Dolphin," 1848–51; receiving-ship "Princeton," in 1852, and Naval Observatory; store-ship "Fredonia," at Valparaiso, Chili, in 1852–55.

Promoted to master in 1855.

Commissioned as lieutenant, September, 1855;

Naval Observatory, Washington, D. C., in 1856; served as executive-officer of the bark "Resolute," originally an English man-of-war, abandoned in the Arctic seas, and subsequently recovered by the American whale-ship "George Henry," which vessel found her in a field of ice some 900 miles from where her crew left her. Congress, by a joint resolution dated August 28, 1856, purchased her from the salvors, and ordered her restoration to the British government, which order was complied with on her arrival in England, where she was honored by a visit from the queen of England and Prince Albert, to whom the vessel was presented by Capt. Hartstene; in the "Niagara," 1857; employed in the first Atlantic Cable Expedition, and then joined the "Susquehanna," in 1858, one of the Mediterranean Squadron; shortly afterwards the vessel was sent to the West Indies, and to Greytown, Central America, when the yellow fever broke out on board, carrying off 60 of her crew and 2 officers, which necessitated her return North, and being put out of commission; in the same year was attached to the "Water-Witch," Home Squadron; executive-officer of "Metacomet," Paraguay Expedition, in 1859; when the Rebellion broke out, was ordered as executive-officer of the "Susquehanna," then commanded by Capt. James Lardner, now rear-admiral, and which vessel took a very prominent part in the battle of Port Royal, S. C., sustaining considerable damage by the fire from the two forts, Hilton Head and Bay Point, having been struck some 35 times, and losing several of her crew, besides the wounded; received a commendatory letter from Rear-Admiral Lardner for services rendered on that occasion; the "Susquehanna" was especially mentioned in the official report of the late Rear-Admiral Dupont, who commanded the expedition; was sent several times with a detachment of sailors and marines to reinforce the "Unadilla," when much exposed to night attacks in Wright River, S. C.; was present at the occupation of Fernandina, Fla., the enemy having abandoned the place on the appearance of the expedition under the late Rear-Admiral Dupont; was then transferred to the sloop-of-war "Vandalia," engaged in the blockading of Warsaw Sound and Charleston, S. C., for a number of months; transferred to the command of the sloop-of-war "Dale," and brought her to Philadelphia.

Commissioned as lieutenant-commander, July 16, 1862; executive-officer of the navy-yard, Philadelphia, in 1863; applied for and received orders to command the "Galena," when rebuilt as a wooden vessel; joined the West Gulf Squadron in 1864; was sent several times by the late Admiral Farragut, then in command of the fleet, to shell a blockade-runner, ashore under the guns of Fort Morgan; was engaged in the battle of Mobile, and during the passage of the forts the "Galena" was secured to the "Oneida," bringing up the rear, both vessels being exposed to the fire of the forts from the commencement to the close of the action, also from the rebel ram "Tennessee"; when near the forts, a shell from the latter exploded one of the boilers of the "Oneida," which necessitated her being turned in by her consort, the "Galena," and after Capt. Mullany, of the former vessel, had his arm shot off, which occurred opposite the forts. The services of the "Galena" were duly acknowledged in the official report of the action by Admiral Farragut, and a commendatory letter was received from him, in which he says, "That in your case I depart from my usual custom, not to give letters for good conduct in time of war, where there is an immediate commander *first* to forward it, but, inasmuch as Capt. Mullany was wounded, and the command of the two vessels ('Oneida' and 'Galena') devolved upon you, and were carried through the battle with great gallantry, I take pleasure in giving my official testimony to your very meritorious conduct in that engagement, and trust that in the future it may be of service to you." East Gulf Squadron, in 1864; refitted in Philadelphia, and joined the fleet of Admiral Porter, in the James River, and remained there until the close of the war; commanded the "Kansas," South Atlantic Station, in 1864–66; visited most of the ports of that station; received a letter of thanks from the English government and the British admiral for going to the assistance of H. B. M. gunboat "Gleaner," reported to be dangerously ashore in Maldonado Bay; the services of the "Kansas" were also acknowledged by the British admiral for assisting in rescuing an English merchant-vessel, aground on the English Bank, River La Plata.

Commissioned as commander, July 25, 1866, and was one of the number selected for promotion by a board of officers for services in the war; attached to the navy-yard, Portsmouth, N. H., in 1868–70; sent to Europe, in 1870, in command of the "Shenandoah."

Promoted to captain, June 19, 1871; visited most of the ports on the Mediterranean, and during this cruise, which continued until 1874, received a letter of thanks from the Italian government, for assistance rendered to the Italian ironclad "Compt de Verde," in the harbor of Spezia, which vessel broke from her moorings in a gale of wind, and came near drifting on the rocks; received the decoration of the Legion of Honor from President Thiers, of France, and Congress, by a joint resolution, March 3, 1875, authorized its acceptance; detached from the "Shenandoah" at Key West, Fla., January 31, 1874; February 26, 1874, ordered as executive-officer of the navy-yard, Boston, Mass.; transferred as captain of the navy-yard, Philadelphia, and equipment-officer, October, 1874; thence to League Island Navy-Yard, January 1, 1876, and ordered in command of that station, January 10, 1876; detached, November 1, 1877, on the completion of the full term of three years on duty at the Philadelphia Station; 1878–79, on court-martial and board duties, and member of Board of Visitors to the Naval Academy in 1878; chief signal officer, 1879–80.

Promoted to commodore, January 22, 1880.

Welshman's Breeches. See DUTCHMAN'S BREECHES.

Welt. A batten riveted over a seam in steam-boilers. *Welt-joint*, one made with a *welt*.

Wentle-trap. A shell; the *Scalaria pretiosa*.

Werden, Reed, Rear-Admiral U.S.N. Born in Pennsylvania, 1818. Appointed from Ohio, January 9, 1834; attached to schooner "Enterprise," Brazil Squadron, 1834–35; sloop-of-war "Ontario," Brazil Squadron, 1836; sloop-of-war "Erie," Brazil Squadron, 1837; sloop-of-war

"Cyane," Mediterranean Squadron, 1838–39; Naval School, Philadelphia, 1840.

Promoted to passed midshipman, July 16, 1840; sailed for China in the sloop-of-war "Boston," October, 1840; frigate "Constellation," East India Squadron, 1841–42; sloop-of-war "Boston," East India Squadron, as master, 1842–43; receiving-ship, New York, 1844.

Commissioned as lieutenant, February 27, 1847; sloop-of-war "Germantown," Home Squadron, 1847; commanded a party of seamen at the capture of Tuspan, Mexico; receiving-ship "Vermont," Boston, 1848; sloop-of-war "Vandalia," Pacific Squadron, 1849–52; naval rendezvous, Baltimore, 1853; sloop-of-war "Albany," Home and West India Squadrons, 1853–54; special duty, West Indies, 1855; Naval Observatory, Washington, D. C., 1856; frigate "Cumberland," on the coast of Africa, 1857–59; frigate "Minnesota," Home Squadron, 1861; commanding steamer "Yankee," North Atlantic Blockading Squadron, 1861; commanding steamer "Stars and Stripes," North Atlantic Blockading Squadron, 1862; at the capture of Roanoke Island and Newbern; commanding steamer "Connemaugh," South Atlantic Blockading Squadron, 1862–63.

Commissioned as commander July 16, 1862; navy-yard, Philadelphia, 1864; fleet-captain, East Gulf Blockading Squadron, 1864–65; commanding "Powhatan," East Gulf Blockading Squadron, 1865; blockaded the rebel ram "Stonewall," in the port of Havana, West Indies, until her surrender to the Spanish government; special duty at navy-yard, New York, 1865; commanding "Bienville," West Indies, 1866.

Commissioned as captain, July 25, 1866; navy-yard, Mare Island, California, 1868–71.

Commissioned as commodore, April 27, 1871; commanding naval station, New London, 1872–74.

Commissioned as rear-admiral, February, 1875; commanding South Pacific Station, 1875–76. Retired March 27, 1877.

West. The point ninety degrees to the left of north. So called in all European languages, except Italian, where it is *Ponente* (*setting*).

Westerly. Moving toward the west, as a current, or from the west, as a wind. Tending toward the west.

Westing. The distance in nautical miles made good to the westward.

West-country Parson (*Eng.*). A fish; the hake (*Gadus marducius*),—so called from a black streak on its back.

Wester, or Waster (*Eng.*). A salmon trident.

Wet. *To wet sails*, to throw water on the sails, in order to make them hold wind better. This was formerly done with a *skeet*, but afterwards a pump and hose were substituted. *To wet a commission*, to give an entertainment on getting a new commission. *Wet provisions*, salt beef and pork, vinegar, molasses, canned beef, and spirits. *Wet goods* are charged to the owner and master of a vessel.

Wethers. The flukes of a harpoon.

Wet-nurse. This term is used to signify an officer acting as an instructor over a junior in watch-duty. See Nurse.

Wexford, capital of Wexford County, Ireland, on the right banks of the Glaney, where it widens into Wexford harbor. The city contains a chamber of commerce, ship-building docks, some malting establishments, and has an active export trade in cattle, dairy and agricultural produce, timber, tallow, hides, cotton, yarn, and wool. Pop. 13,000.

Whale. The popular name of the larger cetaceans, particularly of those belonging to the families Balænidæ and Physeteridæ, or Catodontidæ. The latter of these families has been already noticed under Cachalot (which see). The baleen whale, popularly known as the Greenland Whale (*Balæna mysticetus*), derives its name from the plates of whalebone, or baleen, with which its mouth is furnished in lieu of teeth. These are arranged in two series, consisting each of several hundred plates, which are suspended from the roof of the mouth, extending from each side of its middle line like the barbs of a feather, and terminating in a fringe of fibres or pliant bristles. Through this apparatus are strained out of the water containing them the small crustaceans and mollusks which constitute the food of the whale, the water being allowed to escape by the sides of the mouth. Only very small animals can pass through the gullet of the whale on account of its extreme narrowness, its diameter, even in a large whale, being, it is said, not more than an inch and a half. The head is very large, constituting from a third to a fourth of the whole length of the animal, which varies from 50 to 70 feet. The skull is unsymmetrical, the right side being larger than the left. The eyes are small, but the animal's sense of sight seems to be acute. The mouth is very large. The tongue is a soft, thick mass, not extending beyond the back of the mouth. The flesh is red, firm, and coarse. The skin is naked, with the exception of a few bristles about the jaws, and its surface is moistened by an oily fluid. The lower surface of the true skin extends into a thick layer of blubber,—an open net-work of fibres in which fat is held, and which serves the double purpose of keeping the animal warm and of making the specific gravity of the body much lighter than it would otherwise be. In the genus *Balæna* there is no dorsal fin, nor elevation of the back corresponding to it, as in some of the family. The pectoral fins are 8 or 9 feet long, 4 or 5 broad, and are placed about 2 feet behind the angles of the mouth. The tail-fin consists of 2 lobes of great breadth, measuring from 20 to 25 feet across in the larger specimens, and is wielded by muscles of enormous power. It is this part which constitutes the animal's sole organ of offense and defense. The body is thickest just behind the pectoral fins, whence it tapers conically toward the tail, and slightly toward the head. On the highest part of the head are situated the blow-holes, which are from 8 to 12 inches long, but of comparatively small breadth. The upper parts of the body are velvety black,—but in very old whales sometimes become piebald,—the lower parts are white. The whale has usually but one young at a birth. The period of gestation is unknown, but that of suckling lasts a year. The mother manifests great affection for her offspring.

The Southern, or Cape Whale (*Balæna Australis*), formerly regarded as identical with the Greenland Whale, is now considered as a distinct species, the head being smaller in proportion than that of the northern species, and the color

a uniform black. It attains a length of 50 or 60 feet, and is usually found in comparatively shallow water near the coasts. Its range embraces not only the colder parts of the southern hemisphere, but also the temperate regions and the tropics. Another variety, the Right Whale (*Balæna cisarctica*), heretofore identified with the Greenland Whale, is now recognized as more nearly resembling the Cape Whale. It differs from the former in having the body more slender, and the head proportionally smaller; the under jaw very deep, round, and broad; and the plates of baleen comparatively short. It is of a black color, except as to the lower part of the head, which is a brilliant white.

The species of the genus *Megoptera* are called Hump-backed Whales. They have a rudimentary dorsal fin, in the form of an elevation of the back. There are several species, but some of them are very imperfectly known.

The genus *Balænoptera*, *Physalus*, or *Rorqualus*, belonging to the same family (*Balænidæ*) to which the Greenland Whale belongs, is distinguished by its species having a dorsal fin; an upper jaw less arched than in the Greenland Whale; much shorter plates of baleen, or whalebone; and along the throat and belly numerous longitudinal folds, allowing the distention of the integuments so as to form a great pouch for the reception of water and prey, to be afterwards sifted by the plates of baleen. The cetaceans of this genus are the largest animals now existing, their length being greater, and their girth at least as great as those of the Greenland Whales.

WHALE-BIRD. A small bird seen in whaling-grounds, hovering about shoals of whales, hunting for food.

WHALE-BOAT. A long, narrow boat, from 20 to 50 feet in length, and from 4 to 10 feet beam, sharp at both ends, and admirably fitted for all uses at sea. Whale-boats are supplied to men-of-war, from one to three to each, and are either *single-banked* or *double-banked*. Some gigs are whale-boats. These boats are best in a surf, and they should then be steered with a long oar instead of a rudder. See SURF.

WHALE-CALF. The young whale.

WHALE-CHARTS. Charts prepared by Commodore Maury, giving the localities where whales abounded.

WHALE-FISHERIES. The Northmen were the first to hunt the whale before the 10th century. After them the Biscayans engaged in the whale-fishery from the 12th to the 15th centuries. But the Dutch and English were the first to hunt in Arctic regions, beginning in 1600. Large bounties were paid to whale-ships, and companies formed to prosecute the fisheries. The Dutch fisheries flourished some 30 years, the English much longer. In 1789 the English had 161 vessels engaged in the whale-fisheries, but this number diminished steadily to 82 in 1795, to 61 in 1800, then increased gradually to 91 in 1805, and 112 in 1814, and in 1815 there were 150 vessels and 6000 men engaged in it. From this time it has gradually declined. Hull, Peterhead, and London are the principal whaling ports. The United States began the hunt for whales in 1690, and from 1758 to 1775 Massachusetts alone sent out annually 183 vessels north and 121 south to fish for whales. In 1858, 680 ships were employed, but since then the trade has very much declined. Nantucket, New Bedford, and Gloucester have been the great whaling ports. The word *whale-fisheries* also is used to denote the localities in which the capture of whales is carried on. See WHALING-GROUND.

WHALE-LINE. Rope about 2 inches in circumference, made of the best Russia hemp, tarred and laid up by hand. It is used for harpoon-lines. Is also made of manilla hemp.

WHALER. A whaling-vessel, or one employed in the whale-fishery. A man employed in the whale-fishery.

WHALE'S FOOD. The *Clio borealis*, a mollusk on which the whale feeds.

WHALE-SHOT. Sperm oil when just from the whale.

WHALING-FLEET. The body of whaling-vessels belonging to a port or country.

WHALING-GROUND. The localities in which whales are found. For the right whale this is on the coasts of Greenland and in Davis Strait, and in the North Pacific and Arctic Oceans; for the southern whale, in the South Pacific and Antarctic Oceans; for humpbacks, the neighborhood of the Bermudas; for sperm-whales, in all tropical and temperate seas.

WHALING VOYAGE. A voyage out after whales, and back with the oil.

Whanger. A fish-curer in Newfoundland.

Whapper. A large turtle, of 7 to 8 hundred-weight, found near Ascension Island.

Wharf. A structure of wood, iron, or stone erected on the shore at the water's edge, for the convenience of vessels in loading and unloading. *Gun-wharf*, a wharf at an ordnance-yard or in a navy-yard, appropriated to the use of the ordnance department. *Sufferance-wharf*, in English law, is a wharf where only certain goods may be landed. Wharves where all kinds of goods are landed are there known as *legal quays*. *Sheer-wharf*, a wharf in a navy-yard on which the sheers are erected.

WHARFAGE. Wharves in general. *Wharfage-dues*, dues or fees for landing or shipping goods at a wharf.

WHARF-BOAT. A boat moored at the side of a river and used as a wharf.

WHARF-HOUSE. A house built on a wharf.

WHARFINGER. One who keeps a wharf, or who has the care of it.

WHARF-RATS. The small boys and loafers that infest wharves in large cities.

WHARF-STEAD (*Eng.*). A river-ford.

What Ship is That? A quizzing question put to a sailor using a long word.

Whaup. The large curlew, *Numenius arcuatus*.

Wheel. A circular frame connected to the tiller by the wheel-ropes. In small craft it is not necessary.

WHEEL-HOUSE. A small house erected on the deck, hurricane-deck, or bridge of many ships for the purpose of sheltering the helmsman. The *paddle-box* of a steamer.

WHEEL-ROPES. Ropes or chains leading from the tiller or helm through blocks in the decks and trunks under the beams to the barrel of the steering-wheel, where they are fastened. Soft, pliable rope must be used. In the U. S. navy *hide-rope* is generally used, and wire-rope for steam steering-gear. See STEERING APPARATUS, RUDDER.

Wheft. See WAFT.

Whelk. A shell-fish; the *Buccinum undatum*.

Whelps. The projecting parts on every other square of a capstan-barrel.

Where Away? A query in regard to the bearing of an object reported by the look-out.

Wherry. A decked vessel used in fishing in English waters, sometimes having two lug-sails, at others two shoulder-of-mutton sails. A small light row-boat for one person.

Whiff. A sudden and transient puff of wind. A fish of the genus *Pleuronectus;* the *Rhombus cardina.* A fish of the turbot group; the *Rhombus megastoma.* To fish for mackerel by trolling from a boat in rapid motion.

Whimbrel. The smaller curlew, *Numenius phœpus.*

Whimsey. A small crane for hoisting goods into warehouses.

Whinyard (*Eng.*). An old name for a hanger or cutlass.

Whip. A small and light purchase. *Single whip*, a rope rove through a single block. *Double whip*, a rope rove through two single blocks, the standing-part being near or fast to the upper block. *Whip upon whip*, one whip applied to the falls of another. *Whip and runner*, a whip whose block is attached to a pendant, itself rove through a block and applied to the weight. *To whip*, to bind the end of a rope with twine to prevent it from unlaying.

WHIPPING. Turns of small-stuff or twine around the end of a rope to keep it from unlaying.

Whip-jack. A fresh-water sailor.

Whippers (*Eng.*). Men who clear colliers in the Thames River.

Whip-ray. The *sting-ray*, or *stingaree.*

Whip-staff. A strong bar fastened to the tiller, to move it more easily.

Whirler, or Troughton's Top (*Eng.*). An instrument intended to serve as an artificial horizon at sea, counteracting the motion of the ship by a centrifugal motion given to it.

Whirlpool. An eddy or vortex, where the water moves in circles, caused by the meeting of powerful currents. The most celebrated ones are the *Garofalo*, or ancient Charybdis, on the coast of Sicily, and the Malström and Saltenström, on the Norway coast.

Whirls. Small hooks set in wooden or iron cylinders, which are moved by a band extending to the wheel, and generally used in sets of three. They are used to give the twist to the yarns in making rope. See ROPE, SMALL-STUFF.

Whirlwind. A violent wind moving on its axis, and having also a progressive movement.

Whiskers. Two booms, or iron bars, projecting on either side of the bowsprit, serving as outriggers to the jib-guys. They are the successors of the spritsail-yard. Sometimes they are dispensed with in small vessels, and instead of them a small boom (called a *spread-yard*) is lashed across the forecastle.

Whistle. Whistling is not tolerated in a man-of-war. It is an old superstition that whistling in a calm brings on a breeze, and also that whistling during a gale increases its violence. *To whistle psalms to the taffrail*, to give unheeded advice. *To wet one's whistle*, to take a drink.

Whistle-fish. A species of cod; the *Motella vulgaris.*

White-bait. A small sea-fish of the herring kind; the *Clupea alba.*

White Boot-top. A painted line or ribband carried around the ship under the hammock-nettings.

White-caps, or White-horses. The white patches caused by the breaking of the crests of waves in deep water. They are caused by the wind, and indicate that it will freshen.

White-coat. The skin of a young seal.

White-feather. A symbol of cowardice,—a white feather in a cock's tail being considered a proof of cross-breeding.

White-fish. The *hard-head.* A small fish (the *Alosa menhaden*), used for fertilizing land. A fish of the salmon family (*Coregonus albus*), abundant in the American lakes. The *Beluga catodon*, or white-whale. A general name for ling, cod, halibut, haddock, and tusk, and for roach and dace, whose scales are used to make artificial pearls.

White-herring. A pickled herring. A fresh or unsalted herring.

White-horse, or White Horse-fish. A ray; the *Raia fullonica.* See WHITE-CAPS.

White-lappel (*Eng.*). A nickname for a lieutenant, alluding to white lappels formerly worn on the coat.

White-nun. The *Mergus albellus*, a merganser, or goosander, with a white belly, breast, and throat.

White-powder. A chlorate explosive mixture, composed of 3 parts of potassium chlorate, 1 part white sugar, 1 part potassium ferrocyanide. It is also called German powder. It is extremely sensitive, and dangerous to use. See EXPLOSIVES.

White-rope. Untarred hemp rope.

White-shark. See SHARK.

White-squall. See SQUALL.

White-tape (*Eng.*). A smuggler's name for gin.

White-water. Water over shallow sand-banks, white by the reflection from the bottom.

White-whale. The *Beluga.* See WHALE.

Whiting, William B., Commodore U.S.N. Born in New York, November 13, 1813. Appointed from New York, February 2, 1829; attached to receiving-ship at New York, 1831; sloop "Falmouth," Pacific Squadron, 1831–33; surveys of San Lorenzo, including Boca del Diablo, 1832; surveys of Bays of Ferrol and Samana, and island of Lobos de Tierra, 1833; schooner "Dolphin," Pacific Squadron, 1833; frigate "Potomac," Pacific Squadron, 1833–34; receiving-ship at New York, 1835; frigate "Constellation," West India Squadron, 1835–36.

Promoted to passed midshipman, June 4, 1836; receiving-ship at New York, 1836–37; coast survey, 1837–42; survey of Potomac, 1842–43; frigate "Macedonian," coast of Africa, 1843–45; surveys of Las Palmas and Bay of Gando, 1844; Observatory, Washington, 1845–50; was employed, 1847, under direction of the Navy Department, in drawing plans of the castle of San Juan de Ulloa and the approaches to Vera Cruz; coast survey, 1851–52; sloop "Vandalia," East India Squadron, 1852–56; surveys of Mew Bay and Cumsingmoon, 1852; surveys of west coast of Loo Choo, including Deep Bay, 1853; surveys of Toobootch, Shah Bay, Yeddo Bay, and Hakodadi, 1854; retired, 1855; Naval Observatory, Washington, 1861–71.

Commissioned as commander, July 21, 1861.
Commissioned as captain, 1867.
Commissioned as commodore, 1871.

Whiting. A sea-fish; the *Merlangus vulgaris*. The *Salmo albus*, or white-salmon.

Widow's Men (*Eng.*). Imaginary men formerly borne on the ship's books, for pay in every ship in commission. The pay was applied to a widow's pension fund.

Wild. *Wild-roadstead*, an unsheltered, open roadstead. *To fire wild*, to fire guns with bad aim. *To steer wild*, to steer badly.

Wild-fire. See FIRE-SHIPS.

Wild-wind. An old term for a whirlwind.

Wilkes, Charles, Rear-Admiral U.S.N. Born in New York City, in 1801. He entered the navy as midshipman, January 1, 1818, joining the "Franklin," 74, Capt. Stewart, going to the Mediterranean; was transferred to the "Guerriere," but back again to the "Franklin" in 1820; went to the Pacific Station in the same ship in 1821, returning in 1822; on furlough in 1823–25.

Promoted to lieutenant, April 28, 1826; on waiting orders, 1827–28. In 1829, was on duty, preparing for exploring expeditions, and in 1830, was on duty at Chart Depot, in Washington. In 1830, was attached to the "Delaware," 74, on the Home Station, and in 1831, to the sloop "Boston," in the Mediterranean. In 1833 he was on duty again, preparing for explorations. From 1834–37, was on special duty, being in charge of chronometers part of the time in 1835. In 1838, was ordered to the brig "Porpoise," to prepare for, and in August sailed on an exploring expedition, in command of 2 sloops, a brig, store-ship, and 2 schooners. While absent, he explored the islands of the Pacific, and made important discoveries in the Antarctic continent, and returned to New York in June, 1842. Was tried on charges of irregularities, and reprimanded for illegal punishments. He was in the coast survey during 1842–43, and was promoted to commander, July 13, 1843; was on special duty at Washington, connected with the exploring expedition, from 1844–61; was promoted to captain, April 4, 1855. He wrote the narrative of the expedition, was the author of the volume on "Meteorology," and also published, in 1849, a work called "Western America," and in 1856, "Theory of the Winds." He was given command of the "San Jacinto" in 1861, and sailed in search of the privateer "Sumter," and on the 8th of November took from the English mail-steamer "Trent" the persons of Messrs. Mason and Slidell, Confederate commissioners to England. He was complimented for this by the Secretary of the Navy, although the prisoners were given up, it being an illegal capture. In 1862, commanded James River Flotilla; shelled City Point, August 28; in 1863, commanded a special West India Squadron, and captured many blockade-runners.

Promoted to commodore, July 16, 1862, and retired in 1864.

Promoted to rear-admiral, July 25, 1866, and died at Washington on the 8th of February, 1877, aged 76, having been in the service 59 years.—*F. S. Bassett, Lieutenant U.S.N.*

Williwaw. A light, sudden whirlwind.

Willock. The guillemot (*Uria troile*).

Wilson, Theodore D., Naval Constructor U.S.N. Born in Brooklyn, May 11, 1840; served a regular apprenticeship as shipwright under Naval Constructor B. F. Delano, U.S.N., at the navy-yard, Brooklyn, N. Y.; served for three months at the outbreak of the war as a non-commissioned officer in the 13th Regiment, N. Y. M. On the return of the regiment he was appointed a carpenter in the navy from August 3, 1861, serving afloat in the North Atlantic Blockading Squadron until 1863, during which time he took part in the fight with the "Merrimac," and was in several minor engagements on the coast. On December 15, 1863, he was ordered to special duty under Rear-Admiral Gregory, general superintendent of work outside of navy-yards, and by his order was intrusted with the building, repairing, and alterations of scores of vessels, involving the exercise of great judgment and skill.

Mr. Wilson remained on this important duty until May 17, 1866, when he was appointed assistant naval constructor in the navy. Ordered to duty in charge of the construction department of the navy-yard, Pensacola, Fla.; detached December 28, 1867, he was ordered to the navy-yard, Philadelphia, Pa. While attached to this station as assistant to Naval Constructor S. M. Pook (deceased) he finished and launched the "Omaha," completed the rebuilding of the "Juniata," commenced the rebuilding of the frigate "Brooklyn," and repaired the "Sangamon" and "Dictator"; detached on the 3d of July, 1869, he was ordered to the Naval Academy as instructor in ship-building and naval architecture, where he remained for a period of four years, giving great satisfaction. During the summer of 1870 he was ordered by the Secretary of the Navy to England and France on special service, for the purpose of observing personally the improvements in the construction of iron vessels of war. This duty was satisfactorily performed and much reliable information obtained. Detached from Naval Academy July 16, 1873, he was ordered in charge of the department of construction and repair at the navy-yard, Washington, D. C., and while there rebuilt the sloop-of-war "Shawmut" and fitted her for sea, and put the sloop-of-war "Nipsic" in frame.

He was promoted, and commissioned as naval constructor from July 1, 1873; detached and ordered to the navy-yard, Portsmouth, N. H., June 1, 1874, where he has been stationed for a period of seven and one-half years. He had the supervision of the work on the "Plymouth," "Kearsarge," and "Wachusett," finished the sloop-of-war "Enterprise," launched the sloop-of-war "Essex," fitted for sea the sloop-of-war "Marion," rebuilt and fitted out the sloop-of-war "Ticonderoga," rebuilt and fitted for sea the corvette "Lancaster," the latter vessel being almost entirely rebuilt from his own designs.

Mr. Wilson is a member of the Institution of Naval Architects, England, and is the author of "Ship-building, Practical and Theoretical," which is now used as the text-book at the Naval Academy. He has been longer in the service than any officer on the constructors' list, and is the only officer who has served actively both in the army and navy, ashore and afloat. Selected one of two constructors from the active list as a member of the Naval Advisory Board, for the

purpose of recommending a plan for the reconstructing of vessels in the navy.

Winch. A simple machine having a horizontal shaft turned by a crank or lever. *Steam-winches* are frequently furnished to ships for hoisting boats, ashes, etc. A *rope-winch* is used in laying up rope. See Rope.

Wind. To turn a ship end for end by warps, boats, a tug, or by her sails or engine. To blow a call; to pipe. *To wind away*, to steer through a tortuous channel.

Wind. A current of air in motion. The winds were the mariner's chief reliance until the advent of steam. On them all sailing-ships depend, and they have always been the study of sailors. The Greeks personified the winds. Boreas, Zephyrs, Euros, and Notos (north, south, east, and west winds) were to them actual persons, causing disasters or bringing favoring breezes. A general belief existed in the Middle Ages that they were salable. The Finns and Huns sold them for centuries, and Eric the Norseman was quite an agent of the elements. They delivered 1, 2, or 3 knots in return for fees; to untie 1 brought a good wind, 2 a very strong wind, and 3 a tempest. Bessie Miller, an Orkney maiden, sold them as late as 1814 to the fishermen, at 6[d] a man. Witches were generally believed to deal in them, and the spirit of the storm-wind has yet his believers.

Winds are named from the direction from which they blow, and receive the compass-names, as *west winds*, *east winds*, etc. *Reigning winds*, *leading winds*, *trade-winds*, *monsoons*, *cyclones*, *typhoons*, *sea-* and *land-breezes*, also are designations of particular classes of winds A gentle wind is a *zephyr*, while a *breeze* is more forcible, a *wind* next, a *gale* next, then a *tempest*, and a *hurricane* or *tornado*. In the Mediterranean various local names apply to the winds, as *Tramontana* and *Gli Secchi* (the dry winds) for the north winds, *Solano*, *Levante*, *Bentu de Sole*, and *Chocolatero* for the east winds, *Mezzo giorno*, *Simoom*, and *Siume* for southerly winds, *Ponente* and *Liberator* for west winds, *Gregale* and *Bora* for northeast winds, *Scirocco*, *Maledetto* (evil), *Levante*, *Molezzo*, and *Furiante* (when strong) for the southeast winds, *Vendavales*, *Lebeches*, *Virazones*, *Labeschades* (when squally), *Ouragani* (when tempestuous), *Labbetch*, and *Siffanto* for southwest winds, *Mistral*, *Mistrasu*, *Bize*, *Grippe*, *Vent de cers*, *Maestrale*, and *Mamatete* (when light) for the northwest winds, *Provenzale* for north-northwest winds, *Imbattu*, for sea-breezes, *Rampinu* for land-breezes, *Raggiature* for land-squalls, *Burrasche* and *Raffiche* for hard squalls, *Bonaccia* for calms, and *Golfada* for hard gales.

Generally speaking, winds are *prevailing winds*, *periodical winds*, or *variable winds*. Prevailing winds are those that blow a great part of the time from one direction. Such are the *trade-winds*, and others less known. South and southwest winds prevail on the west coast of Africa all the year. Periodical winds are those that blow a certain part of the time in each year from a certain direction. Such are the *monsoons*. Besides these, on the coast of Africa from Cape Verde to Sierra Leone southwest winds blow from June to September, and northeast winds from October to May, and on the east coast of Africa northerly and southerly winds alternate in winter and summer. The *Levante* blows from the northeast in the Ægean Sea from 9.30 A.M. during the day only. As a rule, beyond the trade-winds the winds prevail toward the pole. But by far the greater part of the inter-trade region is occupied by variable winds, depending on circumstances of temperature, pressure, moisture, and magnetism for their force and direction.

As a general rule, barometric changes of pressure are followed by changes in the wind, and these, in connection with careful observations of changes in temperature and the hygrometric condition of the atmosphere, indicate to the mariner to some extent the nature of the change in the wind. When the wind in the northern hemisphere shifts with the sun—*i.e.*, from left to right—it is said to *haul*, when in the opposite direction it is said to *back*. The former change is more of a permanent character, the latter a temporary and unsettled change. In the southern hemisphere, this is reversed. In general, a rise in the barometer indicates polar, and therefore drier, winds; a fall, equatorial and wet winds. A violent wind is a *gale*, *storm*, *hurricane*, *typhoon*, *cyclone*, or *tornado*. The following table gives the rate and pressure of winds, with the adopted notation in use among sailors, devised by Beaufort:

Miles per Hour.	Feet per Minute.	Pressure in Pounds per Square Foot.	Beaufort Number.	Description of Wind.	Speed of a good ship, or sail she could carry.
0	00	.000	0	Calm.	*Nothing*—all sail.
1	88	.005	1	Light air.	All sail—just steerage-way.
2	176	.020	2	Light breeze.	One to two knots.
3	264	.044			
4	352	.079	3	Gentle breeze.	Three to four knots.
5	440	.123			
10	880	.492	4	Moderate breeze.	Five to six knots.
15	1320	1.107			
20	1760	1.970	5	Fresh breeze.	Close-hauled royals.
25	2200	3.067	6	Strong breeze.	Single reefs, topgallant-sails.
30	2640	4.429			
35	3080	6.027	7	Moderate gale.	Double reefs and jib, etc.
40	3520	7.870			
45	3960	9.900	8	Fresh gale.	Three reefs and courses.
50	4400	12.304	9	Strong gale.	Close reefs and courses.
60	5280	17.733	10	Whole gale.	Main-topsail and foresail, close-reefed.
70	6160	24.153	11	Storm.	Storm stay-sails.
80	7040	31.490	12	Hurricane or tornado.	No canvas.
100	8800	49.200			

With regard to the position of the ship with reference to the wind, she is *close to the wind*, *by the wind*, or *on a wind*, when the yards are braced up and the wind blows from a quarter from 4 to 6 points from the bow. The wind is a *head wind*, a *leading wind*, a *fair wind*, a *free wind*, a *large wind*, or a *scant wind*, as it blows toward the sails from different angles with the keel. *In the wind*, with the wind ahead, so that the sails shake. *In the wind's eye*, directly toward the wind. *Down the wind*, in the same direction the wind is blowing. *Between wind and water*, near the water-line; in that sector of the ship's side which, when she rolls, is covered and uncovered by the water. *All in the wind forward, sir!* a notification from the officer of the forecastle that the head-sails shake. When the wind goes toward the bow of a ship it is said to *haul*, when towards the stern, to *veer* or *draw aft*. *Wind in the teeth*, wind directly ahead, or against the course.

WIND-BANDS. Long stratus clouds, supposed to indicate wind.

WIND-BOUND. Detained by contrary winds.

WIND-FALL. A violent rush of wind from high land. Also, a good stroke of luck.

WIND-GAGE. See ANEMOMETER.

WIND-GALL. A luminous halo on the edge of a distant cloud, where there is rain, generally to windward, and the precursor of bad weather. Similar halos are seen to leeward.

WIND-RODE. A ship is *wind-rode* when riding by the force of the wind, independent of the tides, or against their force.

WIND-SAIL. A funnel of canvas, used to admit air into the lower part of a ship. It is circular, distended by hoops, and hoisted by halliards, while near the head large flaps, extended by bowlines, catch the air and direct it into an aperture in the side of the wind-sail. Another kind has the head entirely open, and there are four flaps, so as to fix it, and avoid constant trimming with every shift of wind or swing of the ship. A wind-sail is also sometimes used protruding from the hawse-holes, to catch the wind when at anchor. Wind-sails are named from the hatches down which they lead, or from the part of the ship they ventilate.

WIND-TAUT. A vessel at anchor heeling over to the force of the wind.

WIND-TIGHT. A cask when it does not leak is wind-tight and water-tight.

WINDWARD. Toward the wind. The weather-side. *To lay an anchor out to windward*, a figurative expression, signifying to adopt precautionary measures; borrowed from a seamanlike manœuvre in times of necessity. *To ply to windward*, to work the ship on a wind.

WINDWARD-SAILING. Turning to windward, or navigating a ship toward the wind by making frequent tacks.

WINDWARD-SET. A set toward the wind, or a flow in that direction.

WINDWARD-TIDE. See WEATHER-TIDE.

Windage. The crescent-shaped space between a shot and the bore of a gun, due to their difference of diameter.

Winding-tackle. See TACKLES.

Windlass. A machine moved by levers or bars, used in small vessels for raising the anchor. A large horizontal cylinder of wood rests in upright pieces bolted to the deck, and called *carrick-heads*, *carrick-bitts*, *windlass-heads*, or *windlass-bitts*. Strong knees support these bitts. On the horizontal roller or *barrel* are *whelps*, and around it the chain is wound when heaving up. Two *chocks* support the middle portion, and on it two *ratchet-pawls* work in ratchets on the cylinder. The ordinary windlass is moved by hand-spikes inserted in holes in the cylinder. Another has brakes like a pump, whose rods are connected to pawl-boxes on either side of the cylinder. These have pawls which take in ratchets on the cylinder on the up and down stroke. Another form has a brake acting by friction on the cylinder on the up-stroke.

The windlass is more powerful than the capstan, but fewer men can be used with it. In the lever-windlass, when the levers are perpendicular, each man exerts from 20 to 30 pounds on it, but when they are horizontal, this is increased to 140 or 150 pounds. A *windlass-capstan* is a combination of the two, in which a windlass moves the spindle of a capstan by gearing. It was patented in 1866, but is little used.

WINDLASS, SPANISH. See SPANISH WINDLASS.

Windle-stray. A kind of sea-side grass or reed.

Windlipper. The first ripples on smooth water, caused by a breeze.

Wine and Beer. These are allowed to seamen in all navies except that of the United States. (See SPIRIT-RATION.) Officers are allowed fermented drinks, but not spirituous liquors.

Wine of Height (*Eng.*). An extra allowance formerly given to men on the accomplishment of some difficult navigation.

Wing. The projecting part of a steamer's deck before and abaft the paddle-boxes. The extremities of a fleet or squadron, either in line or in any order of sailing. The part of the hold and orlop nearest the side of the ship. The wings near the water-line should be kept clear, so that access may be had to them during action to stop shot-holes. *To wing up ballast*, to carry the bottom weights high up to ease the rolling motion.

WING-AND-WING. Before the wind with studding-sails on both sides. In a fore-and-aft-rigged vessel, before the wind with the mainsail on one side and the foresail on the other.

WING-PASSAGE. A passage formerly left in large ships about the wings, to afford a ready access to the side of the ship in action.

WING-SAIL. A quadrilateral sail bent to hoops on the mainmast, and to the gaff of a ketch.

WING-TRANSOM. The largest or main transom in the stern-frame.

WING-WALE. The sponson-rim.

Winnold-weather (*Eng.*). Stormy March weather.

Winter-fish (*Eng.*). Dried cod and ling.

Winter-gull, or Winter-mew. A gull; the *Larus canus*.

Winter-quarters. The quarters of a blockading fleet during the wintry gales. In the Arctic, the spots where ships winter from October to July.

Wiper. See CAM.

WIPER-SHAFT. A shaft carrying a wiper.

Wire. Plain, galvanized, tempered, annealed, and galvanized annealed iron and steel wires

are used in making wire-rope, each possessing peculiar properties.

Wisby, Laws or Code of. An early maritime code framed at Wisby, in England. See MARITIME LAW.

Wise, Henry Augustus, Captain U.S.N. Born in Brooklyn, N. Y., May 2, 1819; died at Naples, April, 1869. Son of George Stuart Wise, an officer of the U. S. navy, who came from an old royalist family, several of whom were taken prisoners, after the Penruddock rebellion, and sent to Virginia, about 1665. At the age of 14, by the influence of his cousin, Gov. Wise, he was appointed a midshipman, and first sailed under Capt. John Percival, the "Jack Percy" of his "Tales for the Marines." He served in the squadron on the coasts of Florida during the Seminole war, and after promotion to a lieutenancy, in the Pacific, in California, and Mexico during the war of 1846–48. On his return to the United States he married the daughter of Edward Everett. In 1862 he was promoted to commander, and made assistant chief of the Bureau of Ordnance and Hydrography; captain, January, 1867; resigned his connection with the Ordnance Bureau, January, 1869. He published in 1849, "Los Gringos"; in 1855, "Tales for the Marines"; "Scampavias," 1857; "Captain Brand of the Schooner Centipede," 1860.

Wishes. Lowlands frequently overflowed.

Wishy-washy. Weak; over-watered.

Wismar. A fortified seaport town of North Germany, at the head of a deep bay of the Baltic. It has manufactories of tobacco and sail-cloth, and important breweries and distilleries. Its harbor is commodious, and nearly landlocked by the island of Poel. It has large ship-building docks. Pop. 15,000.

With, Withe, or Wythe. An iron hoop or ring fitted to the end of a spar or boom, to pass another spar through, so as to hold it in place.

With the Sun. In the direction in which the sun appears to move,—*i.e.*, from left to right. In the direction in which the hands of a watch move.

Withershins. See WIDDERSHINS.

Witheys (*Eng.*). A low place near rivers where willows grow.

Witness. A pile of earth left in digging a dock, etc., to judge how much has been removed.

Witness. Military and naval courts summon witnesses through the judge-advocate or recorder. Any person subject to the jurisdiction of the United States can be compelled to appear and testify. In the event of refusal, the judge-advocate is authorized to issue a process of attachment, similar in form to that employed by the civil courts, and the person appointed to serve such attachment is justified in using needful force to secure obedience. The same rules of evidence obtain in the main as in civil courts, and a witness cannot be required to criminate himself. All testimony is given under oath or affirmation (see OATHS), and a witness who willfully gives false evidence, or corruptly suborns others to do so, "shall, and may be prosecuted in any court of justice in the United States." A witness who refuses to testify, or "behaves with contempt to the court, may be imprisoned, at the discretion of the court, for a term not exceeding two months."

Witnesses are not to be summoned at the expense of the United States, unless their testimony is material and necessary. Civilian witnesses, not in government employ, are entitled to mileage at the rate of 8 cents per mile, and to a per diem of 2 dollars, from and to their domiciles. They must have certificates of attendance from the judge-advocate. Those belonging to the navy and marine corps receive mileage both ways if officers, and actual transportation if enlisted men (Navy Regulations, 1876). Witnesses necessary to substantiate charges against merchant-seamen, sent home on men-of-war from foreign stations to be tried, must accompany them (*ibid.*). Naval witnesses are to appear in service dress (*ibid.*). All witnesses are required to withdraw when charges and specifications are read, and to remain outside of court until called. Exceptions to competency are to be made before the witness is sworn, but, if at any stage of a trial incompetency appear, the court may stop the witness and disregard the testimony. Witnesses must be sworn in open court, and in the presence of the accused; they must not converse with each other concerning the trial. All questions must be put in writing, and the testimony read over for correction before the witness is discharged or withdraws. Any member of a court, the judge-advocate or recorder, can be a witness for either prosecution or defense. When the senior member is called, the next in rank administers the oath. When the judge-advocate takes the stand, the senior member swears him, and he may record his own testimony if there be no clerk. A member called as a witness is not thereby disqualified for the duties incident to his membership, including those in regard to the admissibility of questions put to himself. A witness for the prosecution may also be called for the defense, and need be sworn but once in each case. A court-martial can call witnesses not previously summoned by either side, and this even after both have closed their case. The accused person is entitled to a list of the witnesses to be presented against him, and to have such as are essential to his proper defense summoned. His affidavit can be required as to the materiality of a witness, and he can, at his own request, but not otherwise, be sworn as a competent witness. His failure to so request is not to create any presumption against him (act approved March 16, 1878). See COURTS-MARTIAL, PROVOST-MARSHAL.—*H. C. Cochrane, Captain U.S.M.C.*

Wittee-wittee. A fish-hook of mother-of-pearl, with hair-bait on it, made in the Pacific Islands.

Woare (*Eng.*). An old name for sea-weed. A beach- or shore-margin.

Wolf, or Wolf-net. A kind of fishing-net.

Wolf-fish. The cat-fish, or *Anarrichas lupus*, a fish 2 to 3 feet in length, with large teeth. Also called *sea-wolf*.

Wongs (*Eng.*). Same as *wishes*.

Wood, William Maxwell, Surgeon-General U.S.N. Appointed from Maryland, May 16, 1829; entered the service as assistant surgeon. Commissioned as surgeon, 1838; steamer "Poinsett," Home Squadron, 1838–42; served at that time in co-operation with the army in the Seminole war; Naval Station, Baltimore, 1843; fleet-surgeon, Pacific Squadron, 1844–46; in this period he rendered the service referred to in the

following official documents. Commodore Sloat, commander-in-chief of the Pacific Squadron, writes him: "I am most happy to acknowledge the very important services you rendered the government, and the squadron in the Pacific, under my command, at the breaking out of the Mexican war. The information you furnished me at Mazatlan, from Guadalaxara (at the risk of your life), was the only reliable information I received of that event, and which induced me to proceed immediately to California, and upon my own responsibility to take possession of that country. I have always considered the performance of your journey through Mexico at that time as an extraordinary feat, requiring great presence of mind and address. How you escaped from the heart of an enemy's country and such a people has always been a wonder to me, and has been so characterized on all occasions." The chairman of the Naval Committee of the Senate commented on his valuable services as follows: "Every intelligent mind must at once appreciate the importance of the service which you have rendered the country, and your personal hazard in traveling through the heart of the enemy's country, communicating with your military superior, and furnishing him with the sole and otherwise unattainable information upon which he based the acquisition of California. The importance of this acquisition can best be estimated by asking ourselves, What would have been our national position in the Pacific and upon our Oregon frontier had Great Britain, instead of ourselves, acquired permanent possession of it? I have always contended that its acquisition constitutes one of the navy's strongest claims upon the gratitude of the nation, and this chapter in its history, furnished by your own service, but strengthens this conviction." Receiving-ship, Baltimore, 1847–48; steamer "Michigan," on the lakes, 1850–51; Naval Station, Sackett's Harbor, New York, 1853–55; fleet-surgeon, East India Squadron, 1856–58; during this service, taking part in the Chinese war, and, on board the flag-ship, participating in the brilliant capture (by Commodore Armstrong and the late Admiral, then Commander, Foote) of the 4 forts on the Canton River; steamer "Michigan," on the lakes, 1859–61; fleet-surgeon, North Atlantic Blockading Squadron, during the Rebellion; participating, on board the flag-ship "Minnesota," in the first battle of ironclads,—that of the "Monitor" with the "Merrimac" and other vessels of the Confederate squadron, in Hampton Roads, also in the capture of Sewell's Point; Baltimore, 1866–67; president of the Examining Board, 1868; chief of Bureau of Medicine and Surgery, 1870. Retired, 1871; died, 1880.

Wood. To take in wood. To run a gun out against the side of the port, port-sill, or waterways. Wood has universally been used in the construction of ships, but is fast being replaced by metal. (See Ship.) Various kinds of wood are used in the construction of a ship, and many of the more expensive and ornamental kinds are used in the interior decorations of steamers, yachts, and even of men-of-war. The following are the chief woods used in ship-building: pine, fir, larch, cedar, ash, locust, elm, red willow, walnut, acacia, gum-wood, greenheart, cocoa-wood, lignum-vitæ, teak-wood, saul, sisso, peon-wood.

Wood-and-wood. A close union of two pieces of timber. A nail-head, flush with the wood.

Wood-ends. Hood-ends.

Wooden Walls. The fleet; a term originating with the Athenians, but since appropriated by the English.

Wooden Wings. Lee-boards.

Woodlock. A piece put in the throating or score of the pintle above the load water-line, or as near it as possible, to prevent the rudder from unshipping. One end abuts under the lower side of the brace and the other against the score. It is coppered before being put in, and when in place is secured by driving a copper bolt through it into the stock of the rudder.

Wood-mulls (*Eng.*). Thick hose worn by fishermen.

Wood-sheathing. See Sheathing.

Wood-tar. Tar obtained from wood by distillation.

Woof (*Eng.*). The gray gurnard. The weft or cross threads in cloth.

Woold. To wind rope about a mast or yard where it is fished.

Woolder. A bandage. A stick used in woolding. The bolt of a *Spanish windlass.* The handle of a *rope-maker's-top.*

Woolding. The act of binding with rope. The rope used in binding a mast or spar.

Wool-packs. Light fleecy cumulus clouds in a blue sky.

Woolwich, County of Kent, England, and formerly a naval port, is the seat of the chief government arsenal of Great Britain. It stands on the south bank of the Thames, 7 miles E.S.E. of St. Paul's, London, and now included in the metropolis. The dock-yard, the most ancient in the kingdom, has been enlarged of late years, and has some very fine docks; some of the largest ships of the British navy were launched from it. The yard comprises large dry-docks, and a basin 400 feet long by 300 feet wide. The Royal Arsenal, the largest in Great Britain, contains not only the largest stores of all kinds, but it comprises also establishments for manufacturing them, and for constructing gun-carriages and preparing ammunition for cannon and small-arms. It is the seat of the Royal Military Academy for the education of cadets destined for the artillery and engineers, and is also the headquarters of the royal horse and foot artillery and sappers and miners, for whom and other corps there are extensive barracks here. Pop. 36,000.

Word. The watch-word.

Worden, John L., Rear-Admiral U.S.N. Born in New York, March 12, 1818. Appointed from New York, January 12, 1835; sloop "Erie," Brazil Squadron, 1836–37; Naval School, Philadelphia, 1840.

Promoted to passed midshipman, July 16, 1840; store-ship "Relief," Pacific Squadron, 1843; special duty, 1845; Naval Observatory, 1846; store-ship "Southampton," Pacific Squadron, 1846–47.

Commissioned as lieutenant, November 30, 1846; frigate "Ohio," Pacific Squadron, 1848–50; Naval Observatory, Washington, 1851–52; frigate "Cumberland," Mediterranean Squadron, 1853–55; Naval Observatory, Washington, 1856; navy-yard, New York, 1857–58; sloop "Savannah," Home Squadron, 1859; Home Squadron, 1860; commanded ironclad "Moni-

tor" in her engagement with rebel ironclad "Merrimac," in Hampton Roads, March 9, 1862. During the action Capt. Worden was injured in the eyes by the explosion of a shell from the "Merrimac" upon the outside of the eye-hole of the pilot-house exactly opposite his eye.

Commissioned as commander, July 12, 1862; commanding ironclad steamer "Montauk," South Atlantic Blockading Squadron; commanded the ironclad "Montauk" in the blockading fleet in Ossabaw Sound, and engaged Fort McAllister, on the Ogeechee River, January 27, 1863, and again, February 1, 1863; attacked and destroyed the rebel privateer "Nashville" under the guns of Fort McAllister, on February 28, 1863; commanded the "Montauk" in the attack made by Admiral Dupont, with the ironclad fleet, on the defenses of Charleston, on April 7, 1863.

Commissioned as captain, February 3, 1863. Capt. Worden was promoted out of the line and received the thanks of Congress for distinguished gallantry in the engagement with the "Merrimac," and in other battles in which he had taken part. Special duty, New York, 1864–66; commanded the steam-sloop "Pensacola," North Pacific Squadron, 1867; special duty, 1868.

Commissioned as commodore, May 27, 1868; superintendent Naval Academy, 1870–74.

Commissioned as rear-admiral, November 20, 1872; commanding European Station, 1875–77; member of Board of Examiners since December 29, 1877.

Work. The product of *force* and *motion* in overcoming resistance; its unit is one foot-pound. To labor or strain; as a ship *works* in a sea. To perform; to operate. *To work ship*, to direct or manage a vessel by sails and helm. *To work the engine*, to put it in motion. *To work a day's work*, to compute the run and position of the ship for a day. *To work an observation, a lunar distance*, etc., to make the calculations necessary to find the latitude, etc., from the observations made. *To work a lunar*, figuratively, to sleep during a conversation; to proceed with effort or laboriously. *To work to windward*, to gain to windward by successive tacks. *To work a passage*, to pay for a passage by doing duty. *To work double tides*, to work three days in two, or to work two tides' work in 24 hours. *To work up junk*, etc., to make over junk, old yarns, etc., into gaskets, foxes, and the like. *Working up*, keeping men beyond hours, or working needlessly, as a punishment. *To work off dead-horse*, to perform work paid for in advance. See POWER.

WORKING-HOURS. In a navy-yard the time from bell-ring to 12, and from 1 to bell-ring. The bell rings at 7 or 7.30 A.M., and at 5 or 6 P.M. On board ship, working-hours are from 8 A.M. to 4 P.M., except during meals.

WORKING-PARTY. A gang of men employed in any specified labor.

Worm. To wind a small rope spirally in the spaces between the strands of a large rope. A rope is wormed before being parceled and served.

WORM. A piece of metallic pipe coiled in the form of a helix or spiral, used in distilling. It is immersed in a vessel of constantly circulating cold water, the vapor entering at one end being condensed before reaching the other.

A helical piece of steel wire with a sharp point, attached to a staff, for withdrawing a cartridge from a gun. A small worm is attached to a gun sponge for the purpose of withdrawing fragments of unconsumed cartridge. A screw-thread. See TEREDO NAVALIS.

WORM-EATEN. Perforated by the ravages of the *teredo navalis*.

WORMING. Small-stuff used to worm a rope.

WORM-WHEEL. A toothed wheel, the teeth of which are acted upon, as a nut, by a short screw or *worm*. It is an imperfect piece of mechanism, as the bearing contact can be only a point.

Wrack. A marine plant (the *Zostera marina*), from which kelp is made; also called *sea-wrack*, *sea-wreck*, *sea-oak*, and *sea-tangle*.

Wrain-bolt. A ring-bolt used by shipwrights to bend and bind the planks in place until they are bolted.

Wrain-staff. A stout piece of wood, fitting into the ring of a wrain-bolt, to tighten it up, and so bind the planks in place.

Wrasse. The *Crenilabrus tinca*, or old-wife. A genera of fish (the *Labrus*), containing some 21 species.

Wreck. To destroy or wreck a vessel. To plunder goods from a wrecked vessel, or to gather stranded goods from the beach. The destruction of, or serious injury to a vessel by a stress of weather, or by being cast on shore, on a rock, etc. The ruins of a stranded or wrecked ship. Goods cast up on land from a wrecked vessel.

Among the ancients, shipwrecked persons and vessels were lawful prize, but toward the end of the Roman empire, better laws protected persons and property. The ancient practice was revived during the Middle Ages, when piracy was common. This practice of selling or killing the persons and destroying the ships was continued down to 1680 in the north of Europe. Early English laws gave wrecks to the king, but by laws passed during the reign of Henry III., goods, if marked, could be claimed within a year and a day. But in the reign of Queen Anne, laws were enacted enjoining all magistrates to summon people to assist in saving wrecked persons, goods, etc., on the English coast, and the establishment of a coast-guard and live-saving service has aided there, as elsewhere, in ameliorating the lot of shipwrecked persons. Superintendents of wreck and receivers of wreck were appointed some years since in England, to look out for them. Wise rules as to their conduct, and also laws as to salvage, etc., have been productive of much good in England.

The number of wrecks is yearly great. From 1793 to 1829, there were annually lost 577 vessels of the English mercantile navy, or one-fortieth of the entire amount. In the 5 years, 1863–67, there were 7646 wrecks and 1873 collisions, or in all, 9519 vessels and 3459 lives lost in the English merchant service. About $12,000,000 and 800 lives represent the yearly loss to that nation alone. In 1874, 1999 sailing-vessels, or 3.5 per cent. of all in the world, were lost. Previous to this, in 1870, 2313 were lost, in 1871, 3426, in 1872, 2682, and in 1873, 2165. In 1873 there were 204 steamers, or 4 per cent. of all, lost; and in 1874, 175, or 3½ per cent. 49,322 vessels were wrecked on the English coast in 25 years

(1855–1880). Disasters to steamers on the line of travel between Europe and America have been frequent. From 1840–78, there were 40 steamers lost and 4362 lives sacrificed. Wrecks occur from causes connected with—1. Weather, as gales, currents, seas, fog, lightning, etc. 2. Defective vessels, compasses, charts, etc. 3. Inefficient officers. 4. Machinery and boilers. 5. Miscellaneous, as accident, fire, collision, leaks, absence of buoys or lights, scuttling, and other causes.

Annual reports of wrecks are now made, and summaries published from time to time, notably by the Bureau Veritas, of Paris, and Lloyd's, in London. The United States Life-Saving Service publishes full statistics for the United States. In 1876, 1281 casualties occurred to American vessels, nearly half being total losses. In 1876–77, there were 85 vessels foundered, 220 stranded, 39 collided, and 178 lost from other causes, making a total of 528 vessels lost, involving the sum of $14,500,000, and 1573 were damaged, worth in all more than $63,000,000. In 1877–78, there foundered 79 vessels, while 231 were lost by stranding, 35 by collisions, and 105 from other causes, besides 1492 damaged; 598 lives were lost, and the value of these vessels was $51,000,000, of which $12,000,000 was lost. In 1879–80 there were 300 disasters, 67 vessels being lost. The decrease was 15.72 per cent. in number, and 16 per cent. in tonnage from one to the other year. November, December, and January are the worst months, and the most wrecks then occur.

Wreckage. Spars, rigging, and other floating wreck-stuff.

Wreck-artillery. Wreck-artillery, or wreck-ordnance, comprises such devices as are designed to establish communication between the shore and stranded vessels by means of a projectile carrying a line from the shore to the vessel, or *vice versa.*

There are two principal methods of effecting this intercommunication,—one by means of a line carrying a projectile impelled by the explosive force of powder contained in a gun or mortar, and the other, in which the impelling force is generated in the projectile itself.

To the former class belong all guns, mortars, and muskets used for throwing line-carrying projectiles; to the latter, belong the several life-saving rocket systems.

The U. S. Life-Saving Service has retained the gun and mortar system.

This government first used the old-fashioned cast-iron eprouvette mortar, throwing a 24-pound round ball; then followed a small number of 3-inch Parrott mortars, which gave way in 1878–79 to the 2.5-inch Lyle gun.

The Parrott mortar was made of cast iron lined with a steel tube. The projectile was oblong, rounded at the front end, and somewhat pointed at the rear end, near which was pierced a hole for attaching the line. When loaded the rear end of this projectile extends beyond the muzzle of the piece.

The Lyle gun and system was devised and perfected by Lieut. D. A. Lyle, Ordnance Department U.S.A., in 1877.

It, like the Parrott, is a development of the Manby system, invented during the early part of the present century. Lieut. Lyle prepared guns of three different calibres,—2, 2.5, and 3 inches; the calibre to depend on the range required and the size of line to be used. All these guns are made of bronze, mounted on wooden beds or carriages strengthened with wrought iron.

The 2.5-inch Lyle gun has been adopted by the U. S. Life-Saving Service, and 200 of them have been made, the greater part of which are in use. The braided linen lines made by the Silver Lake Company, of Newtonville, Mass., is used in this country, as giving the greatest satisfaction for shot-lines. These lines, like all others, deteriorate with the lapse of time when stored, and should be replaced every two or three years, else breaks will occur in firing.

The Lyle projectile is made of cast iron, and is cylindro-ogival in form. A wrought-iron shank having an eye at its rear end is screwed into the base of the shot to which the line is attached. The projectile is fired base first, and is reversed by the strain of the line.

I. *Instructions for Use of Lyle Gun.*—Keep the bore of the gun clean at all times. There is often a deposit left after firing, near the seat of the charge, which prevents the projectile from going entirely down to the cartridge. This deposit should always be removed.*

The projectiles should be kept free from rust. The use of emery-cloth and the application of a little oil will protect the shot from rust.

In loading, always measure the distance from the charge to the muzzle with the ramrod or wiper and apply it to the shot. In this manner the gunner can always tell whether the projectile is fully down or is obstructed by dirt or sand.

If the piece be fired when the projectile is not "home," it strains the gun unnecessarily.

II. *Directions for Firing.*—Having the gun and apparatus on the ground, to prepare for firing:

1. Select a place where the gun and carriage may recoil without striking rocks or other obstructions.

2. Note the position of the vessel to be relieved; her distance from the shore, the direction and approximate force of the wind.

3. Place the gun in position, making allowance for the force of the wind and for the drift of the line.

4. Place the faking-box and line on the windward side of the gun, and two or three feet from it,—not more. The box should be on a line with the muzzle of the gun. Loosen the hasps, invert the box, and incline it to the front at an angle of about 45°.

5. See that the vent is clear by inserting the priming-wire.

6. Wipe off the shot with care, freeing it from dirt and sand.

7. Remove the frame and faking-pins, pressing at the same time gently upon the "false" bottom to keep the fakes in place. Then remove the "false" bottom by lifting it slowly until clear of the box.

8. Seize the end of the line, drawing out just enough to reach to the gun without disturbing the fakes in the box, pass the end through the

* Generally removed by using a wet sponge. In very cold weather, alcohol should be used instead of water to prevent freezing.

eye-hole in the shank and tie two or three half-hitches in it, drawing the knot down close to the eye; then wet about three or four feet of the line.

9. Remove the tompion or muzzle-cover from the piece.

10. Insert the cartridge.

11. Insert the projectile slowly until it rests upon the cartridge.

12. Prick the cartridge with the priming-wire to avoid disturbing the elevation after being given.

13. Set the "combination level" to the desired angle.

14. Place the lower arm of the level lengthwise upon the chase.

15. Elevate the muzzle until the bubble of the level stands at the middle of the tube.

16. Adjust the quoin.

17. Unroll the lanyard and insert the hook in the wire loop of the friction-primer.

18. Insert the primer gently in the vent.

19. Stand clear of the line.

20. Fire the piece.

NOTE.—If any of the fakes should slide from the box to the ground, place the loose line in small fakes not more than 18 inches long in front of the box. The necessity for this operation should be avoided if possible.

Comparison.

Piece.	Weight of Piece with Bed, pounds.	Weight of Projectile, pounds.	Total, pounds.	Extreme Range, yards.
Old mortar	288	24	312	421
3.5″ Parrott	535	33	568	631
3″ Parrott	288	22	310	473
2.5″ Lyle	185	17	202	695
2″ Lyle	89	13	102	477

The weight of the Lyle gun, with carriage, as adopted, is 162 pounds; quoin, 4.5 pounds; projectile, 18.7 pounds; total, about 185 pounds. This projectile carries braided lines, Nos. 3½, 4, 4½, 5, 6, 7, 8, 9, and 10, over ranges varying from 300 to over 600 yards, depending on the size of line, charge of powder, and elevation used.

In 1866 the French adopted two pieces of ordnance, *le perrier* and *l'éspingole*, for projecting lines over shipwrecked vessels. Later, M. Delvigne invented a gun for the same purpose. All these pieces project line-carrying arrows (*flèches*) of wood or iron.

Comparison.

Piece.	Weight of Gun, pounds.	Weight of Projectile, pounds.	Diameter of Line.	Extreme Range, yards.
Le perrier	182.9	11.0	0.177″	355
L'éspingole	44.1	4.4	0.177″	196
Delvigne	44.1	17.6	0.315″	328

M. Delvigne obtains a range varying from 196 to 382 yards, depending on weights of projectile and powder-charge, elevation, size of line, direction and force of wind. He claims cheapness and portability combined, with an equal or better range than that obtained with either *le perrier* or *l'éspingole*.

The English have discarded the clumsy system of Capt. Manby, and now use the Boxer life-saving rocket.

The Boxer rocket consists of two rocket bodies, placed end to end, with a conical cavity in each. A portion of solid composition separates the two cavities, so that the forward rocket is not ignited until the composition in the partition and rear one is consumed. The consecutive ignition of the rockets prolongs the time of burning and of flight, thereby extending the range. The line is attached to a long stick fastened on one side of the rocket. The latter is fired from a stand made for the purpose; the line steadying the flight and tending to prevent its deflection from the plane of fire.

The end of the line attached to the rocket is wet, but that does not always prevent its being burned off by the intense heat of the flame that issues from the vent. In firing, a fuze is inserted in the vent at the rear end of the case, and ignited by means of a port-fire.

The rocket bodies are made of Bessemer metal.

The Germans employ 5- and 8-centimetre rockets for carrying lines over stranded vessels.

These rockets have strong metallic bodies, with pointed heads and tripodal bases, into which the rocket-sticks are screwed so as to be in the prolongation of the axis of the rocket. A chain fastened to the end of the stick extends to the rear, in order to protect the line from the flames of the burning composition. The line is attached to the end of the chain.

They also possess an 8-centimetre anchor-rocket for carrying a line beyond the breakers, to be used in hauling a life-boat through the surf after launching. This rocket carries an anchor-head with four flukes or palms at right angles to each other.

With a fair bottom, the "holding" capacity of this anchor is good.

The German rockets all have a fixed fuze in the prolongation of the axis, which is ignited by a short port-fire called a *pillenlicht*. The rockets are fired from an inclined sheet-metal trough. The elevation is given by a quadrant.

The English, Germans, and Americans all have their shot- or rocket-lines put up in boxes.

The lines are stowed away in tiers of peculiar loops, called "*fakes*," in such a manner that they do not become entangled.

The line is wound or faked upon a frame carrying spindle-shaped pins, that hold the loops in position until conveyed to the firing-point, when the box is inverted, the frame and pins withdrawn, leaving the line in readiness for firing.

The Russians make use of a metallic case-rocket, with a stick screwed into the rear end in the prolongation of the axis. Six holes or posterior vents furnish egress to the gases generated by ignition.

In this system the line is not directly attached to the rocket. A chain is fastened to the line to protect it from the flame; the free end of the chain terminates in a ring that is placed upon a projection on the front end of the stand. The under side of the rear end of the rocket-stick is armed with a strong iron hook, which engages the ring as the rocket leaves the tube, and carries out the chain and its appendant line.

The rocket-tube or stand is mounted on a tripod, and consists of a rectangular sheet-iron tube, placed with one of its diagonal planes in a vertical position.

A graduated brass semicircle on one side, furnished with a clamp-screw, serves to fix the elevation.

Comparison of Rocket System.

Kind.	Weight of Rocket, complete, pounds.	Weight of Stand, pounds.	Extreme Range, yards.
Boxer (English)	17.5	30	540
5 cm. German	15.5	35	404
8 cm. German	42.	35	545
8 cm. German anchor	46.5	35	about 400
Russian	25.5	39	?

The range of all line-carrying projectiles depends on their weight, form, on the weight of the powder-charge or composition, elevation, size of line, direction, and force of wind.

The great advantage of rockets is their portability, but this is more than counterbalanced by their erratic flight, their liability to deteriorate from storage, from the expansion and contraction due to changes of temperature, which loosen the composition from the case, allowing the flames to envelop the whole mass, and producing more gas-pressure than the case can stand.

Again, they are very expensive, which precludes any attempt at extended practice by crews of surfmen.

The Massachusetts Humane Society has adopted for use at their life-saving stations—partially, at least—the Hunt line-carrying projectile. This shot consists of a tin cylinder, with a leaden head cast upon one end. Just above this head is a galvanized sheet-iron band, which surrounds the tin case to give greater stiffness to it, and to prevent upsetting by the shock of discharge. A coil of small line, about 0.12 of an inch in diameter, is inserted in the case, which is closed by a wooden plug having a hole in the centre, through which the line is drawn as the shot describes its trajectory. Four trapeziform pieces of tin, styled "wings," are soldered to the outside of the case, near the rear end, to control the flight.

These wings perform a similar function to the feathers on an arrow. A second coil of line is placed at the firing-point. The line is payed out from the two coils simultaneously.

Among other line-carrying projectiles may be mentioned those of Lieut.-Commander W. M. Folger, U. S. Navy, Capt. Butler, U. S. Army, Capt. Chandler, U. S. Navy, Mr. Tatham, of Philadelphia, Mr. Spencer, of New York, and the Lyle-Emery grapple-shot.—*D. A. Lyle, Lieutenant of Ordnance, U.S.A.*

WRECK-CHART. A chart giving the locality and date of shipwrecks on any coast.

WRECK-CLEARER. A station at quarters, the same as *sail-trimmer*.

WRECKER. One who wrecks ships or causes them to be wrecked by false lights, etc. One who visits or searches wrecks for the sake of plunder. One employed in saving life and property from wrecked vessels.

WRECK-FREE. An exemption from forfeiture of wrecked goods.

WRECKING-COMPANY. A company organized to save ships or their cargoes after wreck.

WRECKING-PUMP. A powerful pump used about wrecks, with large suction- and discharge-pipes.

WRECK-MASTER. A person given charge of a wreck or stranded goods by owners or salvors.

WRECKING-TUG. A boat fitted with special appliances for raising, towing, or clearing a wreck.

Wrench. An instrument for screwing or unscrewing bolts and nuts, or pieces connected by screw-threads. It may be either a solid piece, or lever, fitted to a certain-sized *nut*, etc., or adjustable to different sizes; as, a *screw-* or *monkey*-wrench, or a *key*-wrench.

Wright's Sailing. Same as Mercator's sailing.

Wring. To bend, twist, or strain. *To wring a mast*, to distort it by setting up shrouds unequally, etc., or by any strain about the masthead. *To wring a capstan*, to strain it unduly and twist the parts of it out of place.

WRING-BOLT. See WRAIN-BOLT.

WRING-STAVE. See WRAIN-STAFF.

Wrung-head. See RUNG-HEAD.

Wyman, Robert H., Rear-Admiral U.S.N. Appointed midshipman, 1837; attached to razee "Independence" and sloop "Fairfield," Brazils, 1837–38; sloop "John Adams," East Indies, 1838–40; Brazil Squadron, 1840–42; at Naval School, 1842–43.

Promoted to passed-midshipman, June 29, 1843; East Indies, 1843–46; served in the Gulf during the Mexican war; present at the siege of Vera Cruz; Observatory, Washington, 1848; receiving-ship at Boston, 1849–50.

Commissioned as lieutenant, July 16, 1850; sloop "St. Mary's," Pacific and East India Squadrons, 1850–52; Observatory, Washington, 1853–54; practice-ship "Preble," 1855–56; razee "Independence" and sloop "St. Mary's," Pacific, 1856–59; practice-ships, 1859–60; sloop "Richmond," 1860–61; commanding steamers "Yankee" and "Pocahontas," 1861; "Pawnee," South Atlantic Blockading Squadron, 1861–62; battle of Port Royal, November, 1861; commanding Potomac Flotilla, 1862.

Commissioned as commander, July 16, 1862; commanding steamer "Sonoma" in James River, and "Wachusett" and "Santiago de Cuba," West India Squadron, 1862–63; special duty, Washington, 1863; special duty, Navy Department, 1864–65; commanding steam-frigate "Colorado," flag-ship European Squadron, 1865–67.

Commissioned as captain, July 25, 1866; commanding steam-sloop "Ticonderoga," European Squadron, 1867–69; Hydrographic Office, Washington, 1869–70; in charge of Hydrographic Office, 1871–77.

Commissioned as commodore, July 19, 1872.

Promoted to rear-admiral, April 26, 1878; special duty, Washington, 1878; commanding North Atlantic Station since January 15, 1879.

X.

Xantho. A genus of brachyurous crustaceans, containing numerous species, and existing in all seas.

Xebec. A Mediterranean coasting-vessel from 200 to 400 tons, and carrying from 18 to 24 small guns. It is sharp-built, with far-projecting bow and stern, flat floor, and very convex decks. It has three masts, with the fore-raking forward, and sometimes the others also, and a bowsprit and stern-boom. Square yards are used on the fore and main when the wind is fair, but are replaced by lateen-sails when it is not. Oars are sometimes used. Square topsails are sometimes seen on all three masts.

Xero-potamo. Torrents in Greece, dry at times.

Xiphias. A genus of acanthopterygious fishes, including the sword-fish. A constellation in the southern hemisphere, called also *dorado* and *sword-fish.*

Xugia. The second bank of rowers in a trireme.

Xylogodine. Dittmar's powder, an explosive compound of nitric or sulphuric acid and glycerine cellulose. See EXPLOSIVES.

Y.

Y. Abbreviation for *why* in the U. S. General Service Signal Code.

Yachts and Yachting. 1. *Derivation.*—Webster defines the word yacht to mean "a light and elegantly furnished vessel, used either for private parties of pleasure, or as a vessel of state to convey princes, etc., from one place to another; a sea-going vessel used only for pleasure-trips, racing, and the like." The word "yacht" is unquestionably to be traced to the old Danish "jagt," implying a vessel for the chase of others, such as the capture of pirates and smugglers. As a matter of course, speed was in them an essential, and the same property being largely aimed at in pleasure-craft, the original meaning of the word was gradually widened until the interpretation given by Webster became generally accepted. While many vikings of the olden times indulged in pleasure-cruising, combining a voyage of exploration with the adventures of the chase, or the excitement of a piratical descent upon an enemy's coast, the first authentic record we have of any vessel built and owned especially for the purposes of yachting dates back to 1588, when the "Rat of Wight" was launched at Cowes, England. From that day the sport may be said to have firmly planted itself in the favor of the English people, and the town of Cowes has ever since maintained the first position among the yachting ports of the world. From the original little "Rat" has grown a vast fleet of fine vessels of all types and sizes, representing in the aggregate millions of money, and employing a large body of men in the capacity of sailors and attendants. In 1661, Charles II. sailed the first regular match on record, on the river Thames, from Greenwich to Gravesend, his competitor being his brother, the Duke of York. In the words of a historian of the times, "the king lost it going, the wind being contrary, but saved stakes in returning, his majesty sometimes steering himself." From this the modern critic will conclude that the king's yacht was not good for much in windward work, but had the advantage of the opposing craft on the free run home. Charles II. and his brother may fairly be rated as the first "Corinthians" in history, for they handled the tiller and evidently skippered their yachts themselves. The construction of yachts became common enough in the 18th century, and their numbers had increased so rapidly in and about Cork Harbor, that the first club, or organized association, to promote the sport was founded in 1720, under the title of "Cork Harbor Water Club." Cowes followed in 1810, the club containing some vessels of considerable tonnage, in which the features of the man-of-war were more or less closely imitated, while the older boats of the Cork club partook of the nature of open harbor craft, being shaped something like a walnut, with the mast amidships and the bowsprit pointing skyward. The pastime soon became fashionable, being patronized by the Duke of Clarence, afterwards George IV. The Royal Yacht Club,

in reality the parent of all similar institutions of modern times, was organized and adopted a seal in 1812, at which time the number of legitimate yachts reached about 50, belonging almost exclusively to noblemen and functionaries of the government. The number rapidly grew, until in 1850 it is estimated there were 500 afloat. From all sorts of nondescripts, racing had gradually developed something like a recognized type or standard in the prevalence of the "cod's head and mackerel tail" form, as the bluff bows and sharp sterns of the day were denominated. The largest athwartship section, or in technical parlance, the midship section of these yachts was full and round bilged with a moderate angle of dead-rise to the floor, the whole being copied from the carrying vessels of the times. Even at this early period the rules by which tonnage was calculated began to exert a powerful influence upon the shape of the hull, and as measurement for racing purposes has really had more to do than any other cause in directing the course of builders and modelers, it will be well to follow its influences closely. In order that large and small vessels might be raced together with some degree of fairness a certain amount of time was granted by the former to the latter, depending generally upon the length of the course sailed and the difference in size. To obtain a gauge of size the first rule applied was that in vogue in the contemporary commercial marine.

Tonnage was measured by multiplying together the length on the keel and the breadth and the depth, and then dividing by 94, the result being assumed as the actual contents of the vessel expressed in tons. Owing to the difficulty of measuring depth, and the general conformity thereof to one-half the vessel's breadth, the latter fraction was substituted in the rule in place of the actual depth. It worked well enough as long as constructors were inclined to follow such proportions. Yacht-builders, however, were not slow to discover the weak points of the tonnage rule, and, appreciating the advantage of size in relation to speed, they reduced the beam and increased the depth in successive models, obtaining by such stratagem a large boat which would nominally be of small tonnage. The success of such craft in overpowering their smaller rivals rated at the same, or even a larger figure, soon made the narrow and deep hull quite the fashion, all sorts of virtues being imputed to it, the supposed virtues having no other foundation in truth than in the additional size smuggled in at a race and the increased momentum in a seaway. Nor did the builders stop with the modifications indicated, but they gained still further advantage by giving a violent rake to the stern-post, and an overhang to the stem, so completely circumventing the object of measuring the length on keel, that yacht clubs were finally compelled to stretch their tape-line on deck from stem-head to stern-post instead. In later years, the persistent evader of the spirit of measurement crooked or elbowed the upper part of the stern-post to save what he could on the length, and finally took to moving the post bodily forward, until his sharp practice was at last checkmated by measuring for length on the line of flotation itself. These alterations in the rule produced in succession the various types of yachts which, in their day, were regarded as invincible and as the highest development of naval architecture, though being, as a matter of fact, simply more or less successful evasions of equity, and owing their fame to untaxed superiority in size more than to anything else. Wanhill, of Poole, gained fame in this way between 1840 and 1850, when great depth and dead-rise obtained such prominence by the performance of his "Cygnet," "Heroine," and others, while Harvey, of Wivenhoe, in 1852, then an apprentice in his father's yard, carried the rake of the stern-post to the greatest extreme, in rebuilding the well-known little cutter "Kitten," of 10 tons, now owned in Boston, Mass. The amount of experimenting and innovation incidental to the manœuvring for untaxed size was not entirely without its advantages to naval architecture. A great deal was added to our store of practical knowledge concerning the behavior of vessels of various kinds. While Scott Russell and others were engaged in formulating the theories of the science, yacht-builders contributed their quota in the way of actual experiment. The most notable influence upon the design of vessels for speed was produced by the arrival of the schooner "America" at Cowes, July 31, 1851. She may be said to have fairly opened the eyes of the world to the fact that America was rapidly assuming a leading rank as a maritime nation, and that the greatest pitch of perfection in model was to be found in the ports of the new continent, and not in those of the old. The "America" was built in 1851, by George Steers, for Mr. J. C. Stevens, commodore of the New York Yacht Club, then a young, and the only organization of the kind on this side of the Atlantic. The schooner was 87¼ feet long on the load-line, 22.2 feet beam at the same line, and had a mean draft to the rabbet of 8.2 feet. Her load displacement in cubic feet was 5133.2, or 146.6 tons. She carried 45 tons of ballast; her hull weighed 60, and the equipment 41½ tons. The area of her 3 lower sails was 5263 square feet. After her voyage across, made under short spars, she was refitted at Havre, and on the 22d of August, 1851, started in a race for the Royal Yacht Squadron cup around the Isle of Wight, beating the entire English fleet out of sight. Subsequently she defeated the "Titania," and was then bought by Lord de Blacquiere. Under the management of her English crew she was beaten by the "Arrow" and "Mosquito," but in turn vanquished the Swedish schooner "Sverige," a smart vessel, built on much the same principles as the "America," but lacking the latter's beauty and harmony of lines. The great victory of the transatlantic visitor caused a profound sensation among the nautical public.

She differed radically from the English boats of the day in having a long, fine, and hollow entrance, with very easy section-lines to her after body, and carried the greatest breadth, as well as her centres, abaft the middle. In short, she was a "cod's head and mackerel tail," but turned end for end, while the Englishmen had nothing better to pit against her than the round-bodied, bluff-bowed old boxes belonging to a bygone age. The "America's" sails were cut so as to set flat on the wind, while in the English fleet the old "square-riggers" idea of bellying canvas still held sway. In a few words, the English yachtsman was behind the age. Nor was he long in discovering this, for he set to work energetic-

ally remodeling and altering, with the form of the "America" always in view. From the date of her visit the birth of the really modern period of yachting may be reckoned. "Wave-lines," and "wave-line" areas of the cycloidal family, became the standards of the new departure, to which it may be said all the successful yachts of the present era closely conform. The "America" was, however, by no means the first representative of the new departure in design, though the prominence she achieved by her victory at Cowes gave a greater impetus to the new order of things than anything else could have accomplished. Steers himself had built a number of successful yachts on the same principles prior to the construction of the world-renowned schooner, and others in Europe had already discerned the true path, and had put the wave-line theory into practice. The most notable example abroad of the early introduction of the long and hollow bow and cycloidal design is the cutter "Mosquito" of 40 tons. She is also the first authentic iron yacht of note. Both Mr. Ditchburn and Mr. Waterman claim the honor of originating the plans from which the cutter was built by Mare, of Blackwell, in 1848. Her record as a racer is a brilliant one, and upon one occasion she gave a good account of herself in a match with the "America." Like that schooner, the "Mosquito" is a vessel of extraordinary beauty and fairness in all her proportions, and it is an open question whether at this late day anything superior or even equal to these two representative yachts has ever been launched. It is quite certain that we have nothing to equal the "America" on this side of the Atlantic, either in point of speed or seaworthiness, and were it not for the faulty tonnage rule in vogue in England, it is doubtful whether anything of superior mold to the "Mosquito" has left the builders' hands across the sea. The tonnage rule places such a heavy premium upon narrow boats, that the comparatively beamy "Mosquito" would be rated so much in excess of her real size as to seriously interfere with her chances in a race with the lean English cutters of to-day. Both these yachts are remarkable, because at one jump their projectors gave to the world two craft which have been standards ever since, and two craft which must certainly be counted nearly faultless in form. Mechanical structure and contrivances have undergone changes and improvements, details have been perfected, but in form—in the principles of design exemplified by the "America" and the "Mosquito"—the world has not advanced an iota. The efforts of later years have been to equal, rather than to surpass them. Since 1851, a great refinement in model, canvas, gear, and ballasting of the world's yachting marine has taken place in consequence, especially in England; but the old Thames rule, now renovated in some details, and disguised under the name of Yacht-Racing Association rule, still has such an effect upon the form of yachts, that the representative boats of England and America have become widely divergent in all their chief characteristics. Fortunately, actual experiment has shown that the peculiar type of vessel fostered by the Yacht-Racing Association rule is not incompatible with the essentials a rough-water yacht should possess, and if it circumscribes the latitude of the designer, it, at all events, does not hinder the production of a style especially suited to the wants and necessities of British waters; the worst which can be urged against the modern English cutter being her great first cost, as lead ballast has in them become a necessity. In America, on the other hand, through the custom of measuring by length only, without regard to the other two cardinal dimensions, the builder has to an equal extent been driven to the adoption of one set form, from which he finds escape impossible. The size he needs must be sought in those directions which are not taxed in racing. Hence the prevalence, even among our large yachts, of great breadth of beam, and the consequent shallowness of hold and flat floor. While we have not advanced in the least in form, the Englishman may be said to have created, if not invented, an entirely new style of craft, many features of which we are now tardily beginning to copy. If to us the Englishman owes his conversion from the ancient faith of bluff bows and bellowing sails, so have we in turn learned from him the value of ballast on the keel, of easy forms and large displacement for work in open water, and from him we have taken the handy rigs of the cutter and yawl, which have of late come into popularity. From the small nucleus of 500 yachts 30 years ago, the fleets of the world have grown with great strides, until those of Great Britain alone number 3000 sail and over, "Lloyd's Yacht Register" for 1880 showing more than 2500 of which statistics have been gathered. The following table will give an idea of the classification, according to size and rig, of this fleet up to 1878:

Number of Yachts.

	1850.	1864.	1878.
Under 5 tons	4	52	160
5 tons, not exceeding 9 tons	50	137	300
10 " " " 19 "	127	207	403
20 " " " 29 "	85	113	180
30 " " " 39 "	59	69	96
40 " " " 50 "	41	44	89
50 " " " 60 "	27	47	50
60 " " " 80 "	40	59	88
80 " " " 100 "	15	36	60
100 " " " 150 "	33	53	87
150 " " " 200 "	9	30	48
Above 200 tons	10	15	40
Steam-yachts	3	33	282
Total	503	895	1883

According to Rigs.

	1850.	1864.	1878.
Cutters	372	574	754
Schooners	76	207	328
Yawls	45	54	328
Other rigs	7	27	25
Steamers	3	33	282

Tonnage.

	1850.	1864.	1878.	1880.
Average	44	44	47	45
Gross tonnage	22,141	39,485	89,420	120,000

This fleet in 1880 employed no less than 12,000 hands regularly under pay, and represents a value of nearly *ten million* dollars.

If we turn to America, we find even a more rapid development of the sport, considering the want of leisure and wealth prevailing in a new country.

Statistics relating to the earlier days are of

course very meagre, but enough can be gathered from the following compilations to see that if the advance in the future keeps pace with that of the past decade, we may soon expect to surpass Great Britain in the number of our yachts, though it will be a long time before we can out-ton the average of her fleet. At the close of "the war," in 1865, there were only 10 organized clubs in America, with hardly 800 members. In 1879 we find 100 organized clubs, with a membership of over 7500. The fleet in 1865 consisted of about 200 cabin yachts and 150 "open boats." In 1879 it had grown to 530 cabin yachts of which records could be obtained, and the fleet has since then been still further increased by new additions to fully 600. In 1879 they were classified as follows:

150 schooners, average	52 tons.
308 sloops, "	14 "
40 steamers, "	35 "
20 yawls, "	20 "
10 cutters, "	25 "
Total, 530	Average, 27 "

In addition, there are now some 500 small yachts and open boats under 5 tons, of the jib-and-mainsail and cat-boat varieties, and also a score of catamarans. During the past year the popularity of the cutter and yawl has developed, and the leading clubs have from three to a dozen each of the new-fashioned rigs. The total tonnage for 1880 may be set down as about 18,000 tons, employing 2000 hands, and representing nearly $1,500,000. The racing statistics subjoined serve to give an idea of the extent of that phase of the sport and the activity of recent years:

Classification.	1875.	1878.	1879.
Number of starters	......	2373	2365
" " races sailed	144	237	261
" " prizes	436	713	684
" " winners	307	467	508
Average entries per race	......	10	9½
Races in Boston and East	48	80	107
" " New York waters	59	61	53
" " Philadelphia waters	5	26	32
" " Southern waters	7	13	20
" on lakes and in West	20	44	55
Clubs represented in races	45	49	58
Number of winners over 40 feet water-line	......	31	38
Number of winners under 40 feet water-line	......	436	470
Number of winners cat-rigged	......	130	132
" " " sloop-rigged	......	167	205
Number of winners schooner-rigged	......	24	31
" " " not classified	......	146	140

2. *Types of Yachts.*—Of late there seems to be a tendency among architects and owners in America to devise what may be termed a "happy mean" between the extreme types representing the customary practice of Great Britain and this country. The principal characteristics of the two varieties, and the possibility of striking the most satisfactory results by adopting something about half-way between them, can be gathered from the following. The British yacht is the outgrowth, on the one hand, of the old Thames rule of measurement, and on the other, of the demand for capable qualities of all kinds in rough water. These requisites have been successfully attained in the most recent specimens, such as the famous "Vanduara" and the "Samoena," both of 90 tons, the "Jullanar" and "Florinda," of 100 tons, and among the smaller classes by such splendid performers as "Neva," "Britannia," "Vanessa," "Louise," "Madge," and down to the beautiful little 5-ton cutters "Freda," "Coralie," "Vril," and a host of others. They are all yachts of great length and depth in proportion to their beam, and have much of their ballast in lead on the keel. Their sea-going qualities are of the highest order, and leave little to be desired. They are fast in very light winds and in heavy weather. They are uncapsizable, having their greatest range of stability when on their beam-ends, require only small rigs, are easy on their helms, sure in stays even in rough water, and under complete control. The objections to such boats may be counted as their comparatively great first cost, their excessive heeling, and their large draft of water. None of these objections are serious, and upon consideration lose much of their force. Their great cost arises from the universal excellence of their build, such as the use of copper and through fastenings, the best material, hard-wood trimmings, a very complete inventory in all departments, and the prevalence of lead as ballast. As the latter is becoming the metal generally used in all first-class yachts, even in America, the expense attaching to British boats arises rather from their superior quality than from considerations of model. Their excessive heeling takes place only in strong lower-sail winds; in light weather and when reefed down the objection disappears, for they are stiff enough for comfort under such circumstances. In the matter of draft, practice proves a liberal amount an obstacle only in isolated cases or under special circumstances. The normal condition of boats supplied with centre-boards, ostensibly to obviate large draft, is with the board down, in which condition they actually draw more water than if supplied with a keel. There are times when the option of raising the board is a decided advantage, but the occasions for so doing are rare enough to question the advisability of foregoing the advantages inherent to the fixed keel, including the low position of the "outside" ballast, better performance in open water, stronger construction, and increased room in the accommodations,—an item of importance in boats of moderate tonnage. Concerning speed, it has by no means been proven that centre-board yachts are faster than keel vessels, though the former have generally been developed in form to a higher degree than the latter in America, and have created the impression that the centre-board is an essential to high speed. The schooner "America" in competent hands, although a keel, is still without a peer in the centre-board fleet, and enough races have been sailed between the best of the two classes to cause professional men to question the supposed superiority of the board itself. The following tables show in a marked manner the change in form which has been going on in the British fleet, and how the old round ships have been displaced by the modern craft in compliance with the pressure of measurement and the rough-water qualities the yachtsmen abroad value so highly:

The Old British Fleet.

Name.	When Built.	Length on Load-line.	Beam on Load-line.	Depth Amidships.	Mean Draft to Rabbet.	Displacement in Tons.	Area of Lower Sails.	Rig.
Mazeppa	......	30.75	9.17	5	3.15	9.20	......	Cutter.
Vesper	1851	37	9.90	7	4.80	14.11	1232 square feet.	"
Calypso	......	35.70	10.50	6	4	14.20	1326 " "	Sloop.
Emily	1854	39	11	6	5	22	1600 " "	Cutter.
Cygnet	1846	50.90	12.60	10	7.25	45.43	2179 " "	"
Mosquito	1848	59.20	15.30	10.8	8.80	69.25	3077 " "	"
Emerald	......	57.80	18.80	......	7.25	92.70	......	"
Pearl	......	65.30	19.50	......	8	127.50	......	"
Pandora	1852	70	14	8.9	6.25	65	3200 square feet.	Schooner.
Water-Witch	......	88.90	28.8	......	11.20	336.20	......	"
Erminia	......	92.20	22.66	12	9.60	228	......	"
Falcon	......	102.80	27.40	......	11.50	434	9003 square feet.	Ship.
Meteor	1856	68.80	15.70	8.8	6.75	55	3515 " "	Sloop.

Weight of Yachts built prior to 1856.

Name.	Hull.	Ballast.	Equipment.	Total Displacement.
	Tons.	*Tons.*	*Tons.*	*Tons.*
Mazeppa	1.70	5.5	2	9.20
Vesper	2.86	8.5	2.5	14.11
Calypso	2.20	9.5	2.5	14.20
Emily	5.50	11.5	6	22
Cygnet	8.20	28.5	8.7	45.40
Emerald	28	51	13.7	92.70
Pandora	20	30	15	65
Pearl	39	60	28.5	127.50
Meteor	17	18	20	55

*Modern British Yachts.**

Name.	When built.	Length on Load-line.	Beam on Load-line.	Depth.	Mean Draft to Rabbet.	Displacement in Tons.	Area of Lower Sails.	Extreme Draft.	Rig.
Guinevere	1868	121	23	13.3	11	297	8611 square feet.	12	Schooner.
Egeria	1865	93.7	19	10.1	9.8	142	5988 " "	12.5	"
Sea-Belle	1874	90.5	18.9	11.6	10	155	5785 " "	12	"
Aline	1860	100	20.9	11.3	9.4	190	6710 " "	11.6	"
Cambria	1868	100	20.5	11.6	9	167	6418 " "	12.4	"
Livonia	1871	107.5	23.3	11.9	10.8	215	7618 " "	12.8	"
Gwendolin	1870	100	20.5	12.3	10.6	202	6903 " "	13	"
Arrow	1879	72.8	18.3	8.2	7	107	4680 " "	11.5	Cutter.
Miranda	1876	88.5	18	12.7	11.2	.....	5800 " "	......	Schooner.
Kriemhilda	1872	79.3	17.3	11.1	10	115	4405 " "	12.3	Cutter.
Jullanar	1875	100	16.8	13.1	7.8	158	4988 " "	13.8	Yawl.
Florinda	1873	85.7	19.1	10.8	9.4	144	5257 " "	11.9	"
Fiona	1866	73.5	15.8	9.6	8.6	108	3720 " "	12.2	Cutter.
Bloodhound	1874	59.8	12.1	7.8	7	47	2600 " "	9.4	"
Vanessa	1873	47	9.8	8.2	6.10	28.5	1732 " "	7.8	"
Madcap	1871	44.8	10.1	6.9	6.3	27	...... " "	7.5	"
Lily	1875	36.6	8	7.4	4.6	12.9	1095 " "	6.8	"
Freda	1880	50.8	9.8	9.6	7	35.5	1980 " "	9	"
"	1876	31.3	6.1	5.2	4	7.7	800 " "	5.3	"
Heathen Chinee	1876	18	7	4.9	2.8	3.5	335 " "	4.2	Sloop.

Weights of Modern British Yachts.

Name.	Ballast.	Ratio to Displacement.	Name.	Ballast.	Ratio to Displacement.
Gwendolin	90 tons.	.445	Vanessa	16.5 tons.	.579
Cambria	65 "	.389	Freda	19 "	.535
Livonia	70 "	.325	Lily	6.8 "	.523
Sea-Belle	73 "	.471	Pastime	8.4 "	.538
Florinda	52 "	.361	Freda	4.6 "	.605
Jullanar	80 "	.506	Heathen Chinee	1.8 "	.500
Arrow	40 "	.377			
Bloodhound	26 "	.564			

* This table has been taken in part from Kemp's "Yacht Designing," *Field* office, London.

American Yachts.

Name.	Rig.	Built.	Length over all.	Length on Water-line.	Beam.	Depth.	Draft without Board.	Draft with Board.
Sappho	Schooner.	1867	135	119.4	27.4	9.6	12.8	Keel.
Columbia	"	1871	107.10	96.5	25.6	8.4	5.11	22
America	"	1851	100.6	90.6	22.6	9.3	11.6	Keel.
Intrepid	"	1878	113.9	100.7	24	11.8	11 6	"
Crusader	"	1880	88.7	78	21.6	8.3	7.6	18
Magic	"	1869	84	80	21	7	7.1	17
Peerless	"	1871	68.3	60.6	18.9	6.11	4.5	12.8
Clio	"	1873	76.4	67.11	18.6	6	5	18
Clytie	"	1877	85	78.3	21.7	8.3	7.7	18
Cornelia	"	1873	65.8	55.2	17	6	4.8	10
Dauntless	"	1866	120.9	116.5	24.9	9.9	12	Keel.
Dreadnaught	"	1871	117.2	101.11	24	9.9	11	"
Estelle	"	1874	90	80	22.6	6.6	6.6	15
Eva	"	1865	73.3	66.11	22.4	5.11	5	14
Fearless	"	1870	58.3	54.3	16.5	5.9	6	14
Fleetwing	"	1865	108	95	23.4	10	10.6	Keel.
Foam	"	1863	82	76.6	21	7	7.2	14
Halcyon	"	1866	82	79	23.9	7	6	17
Latona	"	1872	61	55.5	18	7	7	Keel.
Madeleine	"	1868	106.4	95.2	24.3	7.9	7.3	19
Meta	"	1872	76	63.6	19.6	6.2	4.6	13
Idler	"	1865	96.2	87.6	22.4	8.5	6.8	18
Palmer	"	1865	112	101	25	9	8.4	20
Phantom	"	1865	104	86	24.11	7	6	17
Silvie	"	1851	82.9	74.7	24.3	6.6	6.5	16
Viking	"	1872	101 9	86.4	23.5	8.2	6.5	18
Wanderer	"	1871	122	103.10	23.6	8.6	12	Keel.
Active	Sloop.	1875	55.6	50	16.6	5.6	4.6	11
Addie	"	1867	64.2	56.6	17.4	5.1	4	11
Alpha	"	1867	49	43	13	5	3.6	10
Annie	"	1861	50	45.6	17.6	4	3.9	9
Arrow	"	1874	66.6	61.8	20.2	6.6	5.6	18
Coming	"	1869	62	57	20.3	5.5	5	15
Drift	"	1861	53	48	18.3	6.3	4.3	16
Egeria	"	1873	49	42.9	15.6	4.8	3.11	12
Elaine	"	1868	54.2	52	18	4.9	4.10	12
Fannie	"	1874	72	66	23.9	6.9	5	17
Flyaway	"	1867	33.11	31.1	11.4	4	3	10
Gael	"	1874	32 6	27.8	10.7	4.6	4.11	Keel.
Genia	"	1873	47 6	39	14.6	4.8	4.4	11
Gracie	"	1868	72.6	65	21.3	6.6	6.3	14
Haswell	"	1858	53.6	49.9	18.6	4.4	4.6	11
Idle Hour	"	1875	22	22	7.6	2	1.2	6
Kaiser	"	1871	45	41	14	4.10	3.9	9
Kate	"	1864	52.1	48	18.6	4.2	4.6	11
Lizzie L.	"	1873	47	43	15	4.3	3.5	13
Madcap	"	1875	47	42	15	4.6	3.9	13
Nimbus	"	......	....	....	......	......	......	...
Orion	"	1869	51.2	46	15.1	5.2	4.8	12
Qui Vive	"	1864	44 11	39.8	14.4	4.5	3.3	10
Ray	"	1853	52.5	47.3	14.10	5.4	7	Keel.
Sadie	"	1867	50	46.10	16.2	6.3	5.3	12
Schemer	"	1871	39 1	36.4	14.6	4.6	3	14
Undine	"	1866	55.8	49	17.6	5.4	4.9	14
Vanitas	"	1873	34.9	27.6	12.2	5.1	5	Keel.
Vindex	Cutter.	1871	62.5	56.5	17.3	7.9	8.9	"
Violet	Sloop.	1866	35.6	32.3	13	5.9	3.10	9
Vision	"	1872	66	52.4	20.9	5.11	5.9	14
Vixen	"	1871	51.1	44.11	16	5.6	4.4	10.6
Volante	"	1869	25	22.3	9	3	1.5	4
White-Cap	"	1869	40	35	14 4	4.6	3.9	10
White Wing	"	1859	60	55	18.8	6	5	12
Republic	Schooner.	1880	96.6	78.6	23	9.3	7.6	18
Frolic	"	1879	56.6	48	15.6	7	7.6	Keel.
Caroline	"	1880	53	45	15.3	7	6.9	"
White-Cap	"	1878	73	65	20.6	8.6	9	"
Norna	"	1879	114	95	20.6	10.6	11.3	"
Mohawk*	"	1875	140	121	30.4	9.4	6	31.6
Consuelo†	"	1876	59.9	55.9	18.4	4.3	4.4	10
Southern Cross	"	1880	73	65	18.6	7.9	7.0	16
Imperia	Sloop.	1878	46.6	40.6	15 3	5.2	4.3	11
Peri	"	1880	....	....	......	....	....	...
Corsair	"	1880	47.5	42.9	17	6	4	13
Mischief	"	1880	67.5	61	19.10	7.8	5.8	15
Elephant	"	1879	36	33	12.6	4.9	3.10	10
Bloodhound	"	1880	58.6	54	16.6	5.6	4.6	12
Æolus	"	1880	45	38.4	15	5	4.6	12
Comfort	Cutter.	1880	36	30.2	12	5.1	5	Keel.
Georgie and Annie	Cat.	1880	26	26	11	3 9	3.6	9
Sunbeam	Sloop.	1873	26.7	24.6	10.3	4	5	Keel.
Hesper	Cutter.	1880	54	45	15.3	7.3	7	14
Cohill‡	Cat.	1877	17	17.8	8.6	2.9	2	5.6
W. T. Lee§	Sloop.	1871	27.6	27.6	12	2.10	2	9
Bluebell‖	Cat.	1877	17	16.2	7.6	2.3	1.9	5
Ruby‖	"	1872	21.6	19	8.6	3	3	Keel.
Ella Treadwell	Sloop.	1873	48	41	15.6	4.10	4.2	12

* Capsized in a squall, drowning owner and passengers. † Has jib-headed or Bermuda mainsail for strong winds of San Francisco Bay. ‡ Philadelphia racing boat, partly decked. Uses shifting ballast. § New York racing boat, partly decked. Uses shifting ballast. ‖ Boston racing boats, partly decked. Use fixed ballast.

Spars of American Schooner-Yachts.

Name.	Rig.	Mainmast Deck to Hounds.	Foremast Deck to Hounds.	Main-topmast, Extreme Length.	Fore-topmast.	Main-boom.	Fore-boom.	Main-gaff.	Fore-gaff.	Bowsprit Outboard.	Jib-boom.
Sappho	Schooner.	73	68.6	52	50	81	35	47	33	30	36
Columbia	"	69.5	69.5	44	43	72.5	31	34.5	30	24.5	33
America	"	71	62.6	25	...	58	Lug.	26	25	18	...
Intrepid	"	66.6	63.6	41.3	41.3	69	29	36.6	27.3	20	16
Mohawk	"	78.6	77	60	55	90	39	41.6	38	30	24
Crusader	"	56	54	35	34	58	24	27.6	23	35	...
Norna	"	59	57	34	33	62	27	34	25	20	16
White-Cap	"	58	56	20	20	56	20	28	19	18	...
Republic	"	61	59	37	35	60	26	30	25	...	...
Southern Cross	"	64	62	38	32	60	22	30	22	38	...
Frolic	"	36	34	26	25	38	15	20	14	15	12
Caroline	"	38	37	18	18	40	15.8	18.6	15.8	15	7

The length of jib-boom of "Intrepid" and "Norna" is given from cap to stay, bowsprit and jib-boom of "Crusader," "White Cap," and "Southern Cross" are in one stick.

The "America" carried a jib only.

"Intrepid" and "Norna" are rigged as cruisers.

Area of "Sappho's" lower sails, 10,223 square feet.

Area of "Columbia's" lower sails, 8000 square feet.

Area of "America's" lower sails, 5263 square feet.

Area of "Mohawk's" lower sails, 10,500 square feet.

Spars of American Sloop-Yachts.

Name.	Mast Deck to Hounds.	Boom.	Gaff.	Bowsprit Outboard.	Topmast, Extreme Length.
Arrow	64	63.11	33	32.14	28
Imperia	30*h*	44	23	20	22
Ella Treadwell	35*h*	44	23.6	18	20
Wave	30*h*	42	28	20	28
Peri	35	38	19	22	22
Corsair	43	44	23	23	24.6
Elephant	38	35	20.6	15	18.9
Bloodhound	54	53	34	23	27
Æolus	43	45	25	19	31
Fanita	48	47	26	20	23.6
Georgie and Annie	31	44	19	...	...
Sunbeam	37	31.6	16	12	...
Hesper	41	46	26.6	25	31
Cohill	32*x*	27	17	...	...
Bluebell	17*h*	22.6	10	...	...
Ruby	22*h*	28	14	...	...
W. T. Lee	26*h*	35	18	26*f*	...

h signifies hoist of mainsail.
x extreme length of mast.
f foot of jib.
The leech of "Bluebell's" mainsail is 24.9 feet.
The leech of "Ruby's" mainsail is 36 feet.

Ballast of American Yachts.

Name.	Tons.	Name.	Tons.
Sappho	80	Caroline‡	6.5
Columbia	35	Arrow	23
Mohawk	40	Mischief	27
America	45	Elephant	7
Southern Cross	7	Fanita	14
Intrepid*	65	Regina	13
Crusader	28	Æolus	7
Republic	27	Comfort§	5
Frolic†	16	Sunbeam	3.5

* 25 tons was in lead on the keel.
† 2½ tons lead on keel.
‡ 2¼ tons lead on keel.
§ 1 ton iron on keel.

In American practice, we find the wide, light-draft boats still prevailing, although a gradual change in the direction of more depth has been steadily showing itself. Owing to the fact that yachting on this side of the Atlantic had its origin in river-sailing, and since much of our sailing is still done in sheltered waters, it is quite natural that the prevailing type of boat should have been largely influenced thereby, and that sea-going qualities in hull and rig should have been neglected. With the accumulation of wealth and greater leisure comes the desire to extend our cruising-grounds and to undertake more or less distant voyages, and a modification of model is taking place in response. The chief recommendations of the wide and shallow boat are her great stiffness and consequent comfort, cheap first cost as long as we remain satisfied with iron ballast, quickness in stays, great speed in strong, lower-sail winds in smooth water, and last, the option of raising or lowering the centre-board as before alluded to. The objections to such boats are serious and numerous. They are very hard on their helms, easily capsized in a squall or through want of close attention; they have little deck-room owing to the almost universal presence of a raised house over the cabin to afford head-room below, and to the length of which the available accommodations are limited in yachts of less than 50 feet. They require large sails to drive them; they are not reliable in stays in rough water, and they are exceedingly bad and violent sea-boats. In light airs they are slow, while in a seaway they are leewardly, and cannot work to windward unless the seas are long, easy swells. Owing to their large draft with the centre-board down, there is much danger of twisting the latter by "sounding" in shoal water, and the trunk or well containing the board is liable to give trouble on account of leaking when strained. The boats are expensive in wear and tear, and not long-lived without heavy scantling and kneeing, deducting materially from the amount of ballast, sails, and speed. The sloop-rig, consisting of a large mainsail and jib, is not adapted to yachts of fair tonnage, its unhandiness involving large crews and being productive of danger in bad weather; its toleration is to be traced to the prevalence of river-sailing in small

boats in years past. As an escape from the sloop's unhandiness the American yachtsman has always exhibited great partiality for the schooner-rig, thereby sacrificing much of his boat's weatherliness and speed to handiness In medium-sized yachts, of 40 to 70 feet, the adoption of the cutter- or yawl-rig gives the necessary control over the canvas and insures the best sailing results. The number of cutters and yawls has increased at a rapid pace during the past two years, the yawl having almost entirely superseded the sloop in the San Francisco Yacht Club. These rigs require only to become better known to be appreciated and adopted in place of the sloop and small schooner, neither of which is appropriate to the work in view. As far as practice has developed there is no difference in speed between the cutter- and sloop-rig, the better disposition of the weights in the former, and the superior facility of handling and trimming the double head-sail, more than counterbalancing the presumed advantage of having all head-sail in one. The yawl is slightly inferior in speed to both, but more efficient again than the schooner. It is, in fact, a cross between the two. For cruising it is to be recommended as a safe and snug rig, always leaving the yacht under control while shortening or making sail, and offering the greatest inducements to short-handed crews. There seems little doubt that a well-considered average between the customs of the two leading maritime nations would lead to the best results. Both countries have gone to extremes in opposing directions so far as model is concerned, owing to the special causes already cited. A design seeking a compromise, in which the points of excellence of each type are represented and liable to none of their weaknesses in as great a degree, will supply the demands of the great majority, who value "all round" qualities rather than great perfection in one direction at a sacrifice of equally as important requirements in another. If the ideal design be supplied with beam enough to obtain fair stiffness, or statical stability, in conjunction with a keel and low ballast, the principal advantage of the sloop has been incorporated with the keel cutter. On the other hand, the excessive draft of the latter, her narrow cabins, "tenderness," and all lead ballast disappear without interfering with the acknowledged excellence of good depth and moderate beam in open water-work. If the fine lines, skillful and handsome form of the American yacht, can be engrafted upon a moderately beamy cutter, the yachting world will be a decided gainer. In British waters the peculiar measurement rule stands in the way; in America, only prejudice and the custom of confining ourselves to sheltered waters near home. Both are giving way; the venturesome yachtsman learns by experience that his shoal, flat-bottom craft, however convenient for harbor-work, is not to be trusted at sea, and his influence is henceforth exerted in behalf of the modifications which have recently taken root and produced some of the most satisfactory yachts afloat. The fleet of the future, on this side of the Atlantic, will probably take shape accordingly, and boats of wholesome dimensions and sailor-like rigs will displace the make-shifts of the day. The prevailing type at present can be gathered from the tables on pages 859, 860.

Racing boats like the "W. T. Lee" carry 50 to 75 bags filled with sand, weighing 50 pounds each. In the Delaware racing boats, such as the "Cohill," the crew "lay out" to windward by means of rope-spans.

In general, owing to the diversity of model and scantling, and the habit of over-sparring, the ballast carried by American yachts varies very much in boats of the same tonnage. The wide boats with little dead-rise weigh much more than those of the same tonnage, but of less beam and more depth. This and their excessive stability of form causes them to sail with very little ballast. Such boats are treacherous in rough water or squally winds, and are rapidly going out of favor.

3. *Steam-Yachts.*—In yachts propelled by steam the naval architect is freed from the necessity of supplying excessive stability, and the problem of successful design becomes much simplified in consequence. As might be expected, such vessels take on a great variety of form according to the wants they are to supply. The steam-cruiser becomes an elongated box, with the ends more or less fined away and the bilge rounded off; the river-yacht, a light cockle-shell with flaring sides, a sharp entrance and fine run, her lack of depth being made good by superstructures of joiner-work; and the high-speed launch assumes the form of a lean-ribbed racer with knife-like entrance and attenuated after body, the entire displacement being devoted to the weights of hull and driving-power. In all these yachts the engineer legitimately supplants the architect to a great extent, and the sailor gives way to the stoker. No strict classification of steam-yachts can be made, one type blending into the other as we pass from river-craft to those designed to navigate the open sea. For small boats the usual style of construction with wooden frames and skin still prevails, although composite build, iron frames with wood planking, has been successfully introduced where lightness and toughness becomes a prime necessity in the pursuit of high rates of speed.

Practical Construction.—Owing to the diversity of the work expected from yachts, much latitude is permissible in practical construction. Generally too much stress is laid upon the importance of heavy scantling, while the durability of the material, its capability of taking and holding fastenings, and especially the character of the latter, are too often overlooked. Where little "through" fastening or clinching and heading is done, the material should be proportionally longer. If much clinch-work is made use of, scantling may be considerably reduced, the structure becoming light and tough, and a unity throughout. The weight thereby saved will be so much more to go to account of ballast, and a larger sail spread, and speed. Oak, hackmatack, chestnut, and Oregon fir are used for frames; cedar, oak, white and yellow pine for plank and ceiling; white pine for decks; oak, mahogany, and walnut for combings and fittings; locust for bitts, pin-rails, and stanchions; and sometimes teak for waist and hatches. Knees are of oak and hackmatack, also of chestnut. The kinds of wood vary much, according to what the local markets afford. Anything that is to give form, hold fastenings, or stand chafe and wear, should be of hard wood; the rest may

British Steam-Yachts.

Name and Owner.	Tonnage, Thames Measurement.	Length, Stem to Stern-post on Deck.	Extreme Beam.	Depth.	Horse-power.	Engines and Maker.	Rig.	Built.	Builder.	General Character.
Wanderer, C. J. Lambert.	708	185.4	29.2	16.1	100	C. I. 25″ & 50″ × 30″. Day, Summers & Co., Southampton.	3 masts. Topsail schr.	1878	Steele, Greenock.	Composite hull. Auxil. steam.
Sunbeam, Thomas Brassey.	532	159	27.6	13.9	70	C. I. 24″ & 42″ × 21″. Laird, Birkenhead.	3 masts. Topsail schr.	1874	Bowdler, Seacombe.	Composite hull. Auxil. steam.
Eothen, J. Ashbury.	340	152	22.2	12.2	70	C. I. 23″ & 40″ × 30″. Stewart, London.	3 masts. Schooner.	1864	Ash, London.	Iron. Sea-going.
Cecil, Mrs. C. A. Gamble.	272	139	20.8	11.3	45	C. I. 21″ & 36″ × 21″. Penn & Sons, Greenwich.	3 masts. Pole schr.	1872	Earle's, Hull.	Iron. Sea-going.
Cinderella, G. W. H. Warder.	228	134	19.3	9.2	68	C. I. 17″ & 34″ × 20″. Campbell & Son, Glasgow.	2 masts. Pole schr.	1874	Seath, Rutherglen.	Iron. Sea-going.
Elspeth, Col. J. Campbell.	174	130	17	9.3	45	C. I. 17″ & 32″ × 24″. J. & G. Thomson, Glasgow.	2 masts. Pole schr.	1877	Thomson, Glasgow.	Iron. Sea-going.
Ina, W. Colquhoun.	126	103.2	16.5	7.6	40	C. I. 15″ & 36″ × 18″. Henderson & Co., Renfrew.	2 masts. Pole schr.	1870	Henderson, Renfrew.	Wood. Coasting.
Anthracite, R. McCalmont.	97	86.4	16.1	10	40	Perkins patent. 8″, 16″ & 23″ × 15″.	2 masts. Pole schr.	1878	Schlesinger, Newcastle.	Iron. Sea-going.
Gueta, R. S. Scott.	86	95	14.1	7.9	40	C. I. 10″ & 20″ × 18″. Scott & Co., Greenock.	2 masts. Pole schr.	1878	Scott & Co., Greenock.	Iron. Sea-going.
Firefly, J. S. White.	54	71.4	13.2	5.9	15	C. I. 9″ & 18″ × 9″. Day & Summers, Southampton.	2 masts. Pole schr.	1877	Day & Summers, Southampton.	Iron. Coasting.
Fox, Gen. Dickson.	33	59.5	11.3	5.9	20	I. 9″ & 9″ × 10″. Vesper, Portsmouth.	2 masts. Pole schr.	1877	Watkins, London.	Wood. Coasting.
Glow-Worm, J. R. Bridson.	21	50	10	5.5	10	I. 8″ & 8″ × 9″. Yates, Blackburn.	....	1878	Allsup, Preston.	Wood. Bay service.
Gamecock, Capt. Coleman.	12	43.1	7.6	3.8	8	I. 6″ × 8″. Thorneycroft, Chiswick.	....	1875	Thorneycroft, Chiswick.	Wood. Cabin launch. Speed, 15 miles.
Gitana, Baroness Rothschild.	71	90	12.7	13.2	90	C. I. Three cylinders. Thorneycroft, Chiswick.	....	1876	Thorneycroft, Chiswick.	Steel hull. Cabin launch. Speed, 24 miles.
Sphinx, J. Mack.	5	33	6	3	....	I. 5″ × 6″. Miller & Tupp, London.	Lugger.	1880	Miller & Tupp, London.	Wood. Open launch.
Miranda................	....	45.5	6.5	....	70	I. Two cylinders.	....	1874	Thorneycroft, Chiswick.	Steel. Cabin launch. Speed, 20 miles.

C. I.—Compound inverted engines. The diameter and number of cylinders and their stroke are given in inches.
I.—Inverted engines.
The "Miranda" is one of Thorneycroft's high-speed launches. Her engines indicate 11 horse-power with 300 revolutions and a speed of 11 miles. With 500 revolutions they indicate 42 horse-power; speed, 16 miles. With 600 revolutions they indicate 71 horse-power; speed, over 20 miles.

be of the pine family, but should be free of sap. Spars are of spruce or Oregon pine. Always build under cover when possible. All surfaces exposed to the weather should be well painted, except decks, combings, and rails, when kept "bright" for stylish appearance. They should be scraped or holy-stoned often enough to prevent the gathering of fungus or weather-eaten spots, as they rapidly extend. A good plan is to whitewash or coat with Stockholm tar all inaccessible parts inside, and especially the skin which is to receive the iron ballast. If the wood has not been well seasoned, especial means should be provided for the circulation of air between the frames by supplying automatic valves in the covering-board, or boring holes in the clamps between the beams. Iron coming in contact with salt water should be galvanized, and an extra allowance made to its thickness where strength is an object. In general, all the rules which apply to ship-building should govern the practice of yacht-builders. It may be said that yachts as a class are too lightly and carelessly built, and much too lightly and negligently rigged and incompletely fitted. The following rules will serve as a guide, though they may be departed from according to the service a yacht is intended for. Where a vessel's form is abnormal, allowances must be made in proportion to the increased strains. In long and narrow boats, greater longitudinal strength must be provided, and in wide, flat-floored boats, additional athwartship strength, and ties must be introduced for stiffening purposes.

American Steam-Yachts.

Name and Builder.	Built.	Length over all, and on Water-line.	Extreme Beam.	Depth.	Greatest Draft.	Engines and Makers.	Diameter of screw and Pick.	Boilers.	Rig.	Character.
Corsair, William Cramp & Sons, Philadelphia.	1880	185/165	23.8	14	10.5	C. I. 24″ & 44 × 24″.	9/13	2 tubular. 10.5′ long, 11′ diameter.	Schooner.	Iron. Flush-deck. Sea-going.
Polynia, Ward, Stanton & Co., Newburgh.	1880	157/146	18	10	9	C. I. 24″ & 32″ × 24.″	9/14	2 tubular. 10 feet diameter, 11 ft. long.	3 masts. Pole schr.	Iron. Flush-deck. Sea-going.
Henriette, Ward, Stanton & Co., Newburgh.	1880	205/164	26	...	12	C. I. 45″ & 38″ × 40″.	10.5/16	2 tubular.	Topsail schooner.	Wood. Flush-deck. Sea-going. Area of sails, 25,000 feet.
Gleam, Herreshoff, Bristol, R. I.	1880	120/110	16	6.5	......	C. I. 10½″ & 18″ × 18″.	....	Patent coil. 5′ 8″ diameter. Herreshoff.	Schooner.	Composite. Bay service. Speed, 20 miles.
Leila, Herreshoff, Bristol, R. I.	1878	100/92	15	6	......	C. I. 9″ & 16″ × 18″.	....	Patent coil. 5′ 8″ diameter. Herreshoff.	2 masts. Pole schr.	Composite. Joiner work house. Bay service.
Julie, Piepgrass, Greenpoint.	1880	80/70	13	4.8	......	C. I. 11″ & 8″ × 10″.	....	1 return tubular, 5.5′ diameter, 6.5′ long.	2 masts. Pole schr.	Wood. Joiner-work house. Bay and river service.
Emu, Sam. Pine, Brooklyn.	1830	84/77	18	6	4.5	Simple. 2 cylinder, 10″ × 10″.	5/8	Tubular. 6′ diameter, 7′ long.	....	Wood. Bay and river. Joiner-work house.
Bretagne, Reany & Malster, Baltimore.	1880	240/210	32.5	19	14	C. I. 28″ & 50″ × 33″.	4 blades. 13′/21′	2 return tubular. 12′ long, 10.5′ wide, 13′ high.	Bark.*	Wood. Flush-deck. Sea-going.
Ideal................	1874	130/110	20.2	8	7	....	....	....	Schooner.	Wood. Coasting and bay service.
Lurline.............	1879	96.8/88.2	16.7	6	6.2	....	....	....	Schooner.	Wood. Bay and river. Joiner-work house.
Ocean Gem.........	1875	101/92	16	6	6	....	....	....	Schooner.	Wood. Bay and river. Joiner-work house.
Lookout............	1876	105/96	16.3	5.2	5	....	....	....	....	Wood. River service. Joiner-work house.
Emily................	1869	90/82	16	5	4.5	....	....	....	Schooner.	Wood. Bay and River. Joiner-work house.
Elf....................	1874	93/79	12	8	5.3	....	....	....	Schooner.	Wood. Coasting and bay. Flush-deck.
Paddle steamer.	1880	64/58	12	4	1.8	Simple, inclined. 16″ × 20″.	Wheels 8′ diameter.	Vertical. 7′ high, 52″ diameter.	....	Light draft for shoal water. Joiner-work house.
Herreshoff launch	1880	33 1	8.8	3.8	1.7 *m.*	C. I. 4.5″ & 7″ × 7″.	31.3/44	Patent coil. 6 sq. ft. grate.	....	Composite. Open launch. For tender service. Speed, 11 miles.
U. S. navy launch.	1880	33.7	8.6	3.8	2.1 *m.*	High press. 1 cyl., 8″ × 8″.	35/54	Return tubular. 6.5 sq. ft. grate.	....	Wood. Open launch. For tender service. Speed, 8.5 miles.
New York Safety Steam - Power Co.'s launch.	1880	25	5.8	2.8	2.3	Simple. 1 cyl., 3″ × 5″.	26/36	Vertical. 28″ high, 45″ diam.	....	Wood. Open launch. Speed, 7 miles.
Javelin, by Herreshoff.	1879	55.2/50.9	8.6	4.6	2	C. I. 5″ & 9″ × 10″.	37/56.7	Patent coil. 8.5 sq. ft. grate.	....	Wood. Cabin launch. Speed, 14 miles.

* The "Bretagne" is sparred as follows: foremast, deck to hounds, 46 feet; topmast, 37 feet; mainmast, deck to hounds, 48 feet; topmast, 37 feet; mizzen-mast, 48 feet; yards, 60, 46, and 30 feet; bowsprit outboard, 15 feet.

C. I.—Compound inverted engines.

Patent Coil.—The Herreshoff coil boiler weighs one half and consumes one half the coal (for power developed) of the ordinary locomotive boiler, and is rapidly displacing the latter in yachts. It requires only a few minutes to raise steam. See New York *Forest and Stream*, vols. xiv. and xv.

m.—Mean draft loaded with 7 persons on board.

When ballast is carried on the keel, the latter is made larger, both from considerations of strength as well as to obtain the room required for the weight. Some English yachts carry nearly all their ballast on the keel. Thick keels have not proven a hindrance to speed. The ballast is held to the keel by through bolts with nuts and washers. A new plan is to cast the floors of iron or lead, thereby bringing the inside ballast as low as possible.

Wooden Yachts.

Approximate Length on Water-line.	Double Floors sided and molded each at Heel.	Siding of Keel, Stem, Stern-post and Dead-wood.	Thickness of Plank.	Clamps and Bilge Plank.	Diameter Rudder-head.	Frames between Centres.	Spacing of Beams.	Beams sided and molded.	Thickness of Deck Stuff.	Bolts through Dead-wood, Keelson, Floors, Knees, Hooks, Clamps, and Butts.	Diameter Hard-wood Treenails.
25	1¾×2¼	3¾	1	1¾	4½	12	26	3¾×3¼	1½	¼–⅝	...
34	3×4	4¾	1¼	2	5	14	32	4¾×4	1¾	⅜–¾	..
46	4¼×5½	6	1½	2¼	5½	17	36	6×5	2	½–¾	...
60	5½×7	7½	1¾	2½	7	20	40	7×6	2¼	½–¾	¾
80	7×8¾	9	2¼	2¾	8½	23	44	7¾×6¾	2½	½–⅞	1
100	8×10	10½	2½	3	10½	24	46	8¼×7¼	2¾	¾–1	1

Iron Yachts.—According to Lloyd's rules, the following table is based upon the proportions as well as the tonnage of the yacht. The scantlings are for boats of not unusual form.

The number for regulating sizes of frames, reversed frames, and floors is obtained by the addition of the half beam amidships, the depth from upper part of keel to top of upper deck beams, and the girth of the half-midship frame measured from centre line at top of keel to the upper deck stringer-plate in feet.

The number for regulating sizes of keel, stem, stern-post, keelson, and outside plating and deck, etc., is obtained by multiplying that which regulates the size of frames, etc., by the length of the vessel.

Iron Yachts.

Number for Frames and Floors.	Angle-iron Frames.	Reverse Frames.	Floors.	Numbers for Keel, Stem, Post, and Plating.	Spacing of Frames.	Keel, Stem, and Post.	Outside Plating.	Middle Line Keelson.	Thickness Upper Deck.	Rudder-head.
20	1½×1½×¼	....	7×¼	1100	18	4½×⅝	$\frac{5}{32}$	....	1¾	1½
25	2×1¾×¼	1½×1½×¼	9×½	1700	18	4½×⅞	¼	....	2¼	2
30	2¼×2¼×$\frac{5}{16}$	2×1¾×¼	11×¼	3100	21	5¾×1⅛	⅜	7½×⅜	2½	2⅞
40	3×2½×$\frac{5}{16}$	2½×2¼×¼	14×$\frac{5}{16}$	5100	22	6½×1¼	$\frac{7}{16}$	8½×$\frac{7}{16}$	2¾	3½
48	3×2¾×⅜	2½×2½×$\frac{4}{16}$	16×$\frac{5}{16}$	6800	22	7×1⅜	½	10×½	2¾	3⅞

These examples are of actual steam-yachts of 25, 50, 100, 250, and 400 tons respectively.

On the two smaller ones angle-irons are worked over the floors in place of a keelson. The larger ones have also angle-irons on upper and lower edge of the keelson-plate, besides deck-stringer and tie-plates. The garboards and sheer-strakes are somewhat heavier than the side plating. The plating tapers at each end. Up to the number 3500, reverse frames need be fitted only under ballast, engines, and boilers. From 3500 up to 6500, reverse frames are required on every frame, and should run well up to the turn of the bilge. If over 6500, every other one must be run up to the gunwale. Bulk-heads are made of ¼ inch iron, and stiffened with angle-iron. In steel yachts a deduction of 10 to 15 per cent. may be allowed, but is not advisable in open-water yachts, as the thin plating is liable to buckle and corrode through. The size of beams depends upon the beam of the yacht. For 8 feet beam angle-iron is used, $2\frac{1}{2} \times 2 \times \frac{1}{4}$; for 12 feet beam, $3\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{16}$; for 15 feet beam, $4\frac{1}{4} \times 3 \times \frac{6}{16}$; for 20 feet beam bulb-iron takes its place, $5 \times \frac{5}{16}$, with double angle-irons at the upper edge, $2 \times 2 \times \frac{5}{16}$; for 25 feet beam, $6\frac{1}{4} \times \frac{6}{16}$ bulb-, with angle-irons $2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{16}$. Rivets for ⅛ plate are ⅜ inch in diameter; for ¼ plate, ½ inch; for ½ plate, ¾ inch. The corresponding spacing should be 1½, 2½, 3½ inches between centres for water-tight work. Double those distances nearly for ordinary work. The same rules and tables apply to iron sailing-yachts.

Anchors, Chains, and Hawsers.

Approximate Length on Water-line.	Number of Anchors.	Best Bower in Pounds.	Diameter of Chain for Same.	Circumference of Suitable Hawser.
25	2	50–75	$\frac{9}{32}$	.....
34	2	80–100	$\frac{6}{16}$	4
46	2	135–150	½	4½
60	3	200–225	⅝	5
80	3	375–425	$\frac{11}{16}$	6
100	4	625–700	$\frac{13}{16}$	6½

For steam-yachts deduct 20 to 33 per cent., the greater difference being between small yachts.

Spars and Sails.—The masts of sloops, cutters, and yawls, when supplied with a single head-sail only, are stepped from 28 to 33 per cent. of the load-line from the forward end. When rigged with double head-sail, the mast is stepped 40 to 45 per cent. from forward, to allow foot enough to the fore-stay-sail. In schooners the position of the masts varies much, the object to be kept in view being the balancing of the centre of the sails, and the centre of the immersed longitudinal plane. The former, known as the "centre of effort," should be placed slightly forward of the latter in round-bodied boats with flare to the bows, and in narrow, long-bowed, deep boats, it may be placed almost directly over the centre of lateral resistance. This plan of arranging sails works very well in vessels which are not extravagant in form. Practical men term the operation "hanging" a vessel, and often obtain an excellent balance by the thumb rules derived from long experience. In English cutters masts are stayed about plumb. Some of their schooners have a moderate rake of 1 to 8 or 1 to 10. American sloops have a rake of 1 to 10 or less, and some of our yachts have none at all. Rake is purely a matter of fashion, and has not been found of any practical value, unless in exceptional cases, where lifting power was desired in the sails, or to bring the dynamical moment of the spars farther aft. Masts are given 1 inch in diameter to every 4 feet of length, booms and gaffs 1 to every 5 feet.

Fixed bowsprits of small yachts are made of more or less rectangular section, with the longest side placed transversely. English yachts have running bowsprits, which can be reefed or housed in bad weather, when a small jib is set. Storm-jibs in American sloops are carried out and hooked to an eye-bolt about half-way out on the bowsprit. Fixed bowsprits are objectionable in sea-going yachts unless very short, and are disappearing in such craft. Topmasts should be long, half the length of the mast, and housed when not wanted. Fixed topmasts will serve in small craft intended for river-work only. Sails for yachts of moderate size are made of 10-ounce duck, for large boats of No. 7 and No. 6 canvas, while storm-sails are made of No. 5 and No. 4. The numbers of canvas are regulated by the weight of a bolt or yard. Thus, No. 1 weighs 46 pounds to the bolt of 40 yards; No. 2 weighs 43 pounds; No. 3 weighs 40 pounds, and so on. Bolt-rope should be of the best Riga hemp, the yarns tightly twisted, but the strands not laid up too tightly. It is about 1¾ inches in circumference for head and foot of schooners' sails, and 2½ and 2 inches for luff and leach. For small yachts 1½ to 2 inches, and for sailing-boats from 1 to 1½ inches, a "drawing-string" in the after-seam often taking the place of the bolt-rope on the leach of the mainsail. For storm-sails add 10 or 15 per cent.

6. *Organization.*—Yacht clubs are organized with a board of officers composed of a commodore, vice-commodore, treasurer, secretary, and measurer. To these a rear-commodore is added when the fleet is numerous enough to justify it. The constitution of a club provides for the election of officers,—generally once a year,—specifies their duties, the manner of voting, rules governing the admission of new members, honorary members, life members, meetings, assessments, and amendments. The duty of the commodore is to take command when cruising in squadron, to preside at meetings, to enforce the rules and regulations, and he may call special meetings. The vice-commodore acts for him in his absence, and the rear-commodore in the event of both being absent. The latter two also take command of subdivisions of the fleet. The secretary keeps the records of the club, roll of members, list of yachts, etc., and does all the correspondence incidental to his duties. The treasurer takes charge of all dues, fines, and moneys, and keeps an account of the same, reporting at specified times to the club. The measurer takes the dimensions of yachts necessary to calculate their racing-measurement and time-allowance, for which he generally receives a fee to compensate for time and expense. On all matters concerning the yachts voting is restricted to owners; on general subjects all members have a vote. A regatta committee is also elected to arrange and supervise the details of all club regattas and matches, and also to act as judges, time-keepers, etc., for the same. The house committee looks after the club headquarters, annual dinners, etc., and the committee on membership reports for or against the propriety of electing applicants. The by-laws define the dues, when payable, when overdue, and how they are to be enforced. They specify dates and places of meetings, manner of notifying members, club-signals, hoisting colors, and discipline in general, compensation to officers, expulsions, publication of club-books, regatta-courses, etc.

SAILING RULES.

The most perfect and clearly-defined sailing rules, now universally accepted, are those adopted by the Yacht-Racing Association of Great Britain, and we cannot do better in America than accept them as they stand, barring the rule of measurement, which is open to the objections before noted. They are as follows:

1. *Management of races.*—All races, and all yachts sailing therein, shall be under the direction of the flag-officers or sailing committee of the club under whose auspices the races are being sailed. All matters shall be subject to their approval and control; and all doubts, questions, and disputes which may arise shall be subject to their decision. Their decisions shall be based upon these rules so far as they will apply, but as no rules can be devised capable of meeting every incident and accident of sailing, the sailing committee should keep in view the ordinary customs of the sea, and discourage all attempts to win a race by other means than fair sailing and superior speed and skill. The decisions of the sailing committee shall be final, unless they think fit, on the application of the parties interested, or otherwise, to refer the questions at issue for the decision of the council of the Yacht-Racing Association. No member of the sailing committee or council shall take part in the decision upon any disputed question in which he is directly interested. The sailing committee, or any officer appointed to take charge for the day, shall award the prizes subject to Rule 31. If any yacht be disqualified, the next in order shall be awarded the prize.

2. *Postponement of races.*—The sailing committee, or officer in charge for the day, shall have

power to postpone any race, should unfavorable weather render such a course desirable.

3. *Tonnage.*—Cites the English manner of measuring tonnage by multiplying length on load line, less the beam, by the beam, and again by the half beam. For this rule it is better to adopt some method more compatible with the needs of American yachts, such as the addition of length and beam, the multiplication of the two, the multiplication of all three cardinal dimensions, or something in conformity with the remarks at the close of this article. The rules of the Seawanhaka and Royal Nova Scotia Yacht Clubs will serve as guides where tonnage is estimated by a consideration of two or three dimensions.

4. *Time allowance.*—Time shall be allowed on arrival for difference in tonnage, according to the annexed scale, increased or decreased in proportion to the length of different courses.

Shortening course.—If it is necessary during a race to shorten the course, the signal-flag denoting the race hoisted under the white peter, or in case of fog or darkness two guns fired shall show that the race is to finish with the round about to be completed, and the time allowance shall be reduced in proportion.

5. *Entries.*—Entries shall be made with the secretary at least 48 hours previous to noon of the day appointed for starting each race. In case of a Sunday intervening, 24 hours shall be added. Entries may be made by telegram, and it shall be deemed sufficient that the same shall have been dispatched before noon of the day on which the entries close, subject to the provision as to Sundays.

Form of entry.—To be signed by the owner, or his representative, previous to the race:

Please to enter the yacht for the race at , on the . Her distinguishing flag is ; her rig is ; and her tonnage is tons. I undertake that while sailing under this entry she shall not have on board *any bags of shot;* that all her ballast shall be properly stowed under the platform or in lockers, and shall not be *shifted or trimmed in any way whatever;* and that I will obey and be bound by the Sailing Rules of the Yacht-Racing Association.

Races re-sailed.—Should any yacht duly entered for a race not start, or having started should she give up or be disabled during the race, such yacht shall, in the event of the race being re-sailed, be entitled to start; but no new entries shall be received under any circumstances whatever for a postponed race.

6. *Ownership.*—Each yacht entered for a race must be the *bona fide* property of the person or persons in whose name or names she is entered, who must be a member or members of a recognized yacht club.

7. *Only one yacht of same owner.*—No owner shall be allowed to enter more than one yacht in a race, except in cases in which a prize is given for each rig, when one yacht of each rig may be entered, nor shall he be entitled to enter the same yacht under different rigs for any race.

8. *One yacht entitled to sail over.*—When a prize has been offered for competition, any yacht duly entered may claim to sail over the course and shall be entitled to the prize; subject, however, to Rule 2.

9. *Sliding keels.*—No yachts which are fitted to shift keels, or to otherwise alter their form, shall be permitted to enter.

10. *Member on board.*—Every yacht sailing in a race shall have on board a member of a recognized yacht club, who, before the prize is awarded, shall sign a declaration that the yacht under his charge has strictly conformed to all the sailing regulations, as follows:

Declaration that rules have been observed.—I hereby declare that the yacht whilst sailing in the race this day, has strictly observed the sailing rules and regulations.

11. *Distinguishing flags.*—Each yacht must carry, at her main-topmast head, a rectangular distinguishing flag of a suitable size, which must not be hauled down unless she gives up the race. If the topmast be lowered on deck or carried away, the flag must be re-hoisted in a conspicuous place as soon as possible.

12. *Instructions.*—Every yacht entered for a race shall, at the time of entry, or as soon after as possible, be supplied with written or printed instructions as to the conditions of the race, the course to be sailed, marks, etc. Nothing shall be considered as a mark in the course unless specially named as such in these instructions.

13. *Sails.*—There shall be no restrictions as to sails, or the manner of setting and working them; but steam-power must not be used for hoisting sails.

14. *Crew and friends.*—There shall be no limit as to the number of paid hands, and no restrictions as to the number of friends, or to their working. No paid hand shall join or leave a yacht after the signal to start. [This rule is not intended to apply to Corinthian matches.]

15. *Fittings and ballast.*—All yachts exceeding 5 tons shall be fitted below deck with the ordinary fittings of a yacht, including two transverse bulk-heads of wood, and their platforms shall be kept down and bulk-heads standing. No water shall be started from or taken into the tanks after the signal to start has been made. No more than the usual anchors and chains shall be carried during a race, which must not be used as shifting ballast, or for altering the trim of the yacht. No bags of shot shall be on board, and all ballast shall be properly stowed under the platform or in lockers, and shall not be shifted or trimmed in any way whatever during a race. No ballast shall be shipped or unshipped after 9 P.M. of the day previous to the race. A race re-sailed shall, so far as regards this rule, be considered a new race.

16. *Boats and life-buoys.*—Every yacht exceeding 30 and under 70 tons, shall carry a boat on deck not less than 10 feet in length and 3 feet 6 inches beam, and every yacht of 70 tons and over, one of not less than 12 feet in length and 3 feet 6 inches beam, with oars lashed in them, ready for immediate use. Each yacht shall carry at least one life-buoy on deck ready for use.

17. *Starting.*—The yachts shall start from moorings, or under way, as directed by the sailing committee. Half an hour before the time of starting one of the following flags of the Commercial Code shall be hoisted as a preparative flag for the yachts of each successive race; in case of a start from anchors or moorings to take up their stations for the start with head-sails

down, or all sails down, as the sailing committee may direct; or in case the start be a flying one, to approach the starting-line, viz.:

B	of Commercial Code for the yachts of the	1st race.
C	....	2d "
D	....	3d "
F	....	4th "

and so on.

Signals to start.—Five minutes before the start the preparative flag shall be lowered, a blue peter hoisted, and a gun fired; after which, the yachts in the race shall be amenable to the rules. At the expiration of five minutes *exactly*, the blue peter shall be hauled down and a second gun fired as a signal to start. If the start is to be made from anchors or moorings, lots shall be drawn for stations, and springs shall be allowed on the same bridle or anchor chain or warp as the bow-fasts, but are not to be carried to a buoy, pier, other vessel, or fixed object.

Dragging moorings.—If any yacht lets go or parts her bridle before the signal to start, or if she drags any moorings or anchor to which she is made fast for the purpose of starting, she shall be liable to be disqualified, unless such parting or dragging be explained to the satisfaction of the committee, or unless she has returned, after the signal to start, within the line of starting-buoys, so as not to obtain any advantage by the accident.

Crossing the line.—In a flying start, if any yacht, or any part of her hull or spars, be on or across the line before the signal to start is made, she must return and recross the line; a yacht so returning, or one working into position from the wrong side of the line after the signal to start has been made, must keep clear of all competing yachts. Should the gun miss fire, the lowering of the blue peter shall be the signal to start.

18. *Meeting end-on.*—If two yachts are meeting end-on, or nearly end-on, so as to involve risk of collision, the helms of both shall be put to port, so that each may pass on the port side of the other.

19. *Two yachts crossing.*—When two yachts are crossing so as to involve risk of collision, then if they have the wind on different sides, the yacht with the wind on the port side shall keep out of the way of the yacht with the wind on the starboard side, except in the case in which the yacht with the wind on the port side is close-hauled and the other yacht free, in which case the latter yacht shall keep out of the way; but if they have the wind on the same side, or if one of them has the wind aft, then the yacht which is to windward shall keep out of the way of the yacht which is to leeward.

20. *Overtaking, rounding-marks, etc.*—A yacht overtaking another yacht shall keep out of the way of the last-mentioned yacht, but when rounding any buoy or vessel used to mark out the course, if two yachts are not clear of each other at the time the leading yacht is close to, and actually rounding the mark, the outside yacht must give the other room to pass clear of it, whether it be the lee or weather yacht which is in danger of fouling the mark. No yacht shall be considered clear of another yacht, unless so much ahead as to give a free choice to the other on which side she will pass. An overtaking yacht shall not, however, be justified in attempting to establish an overlap, and thus force a passage between the leading yacht and the mark after the latter yacht has altered her helm for the purpose of rounding.

21. *Obstructions to sea-room.*—When passing a pier, shoal, rock, vessel, or other obstruction to sea-room, should yachts not be clear of each other, the outside yacht or yachts must give room to the yacht in danger of fouling such obstruction, whether she be the weather or the leeward yacht; provided always that an overlap has been established before an obstruction is actually reached.

22. *Luffing and bearing away.*—A yacht may luff as she pleases to prevent another yacht passing to windward, but must never bear away out of her course to hinder the other passing to leeward,—the lee side to be considered that on which the leading yacht of the two carries her main-boom. The overtaking vessel, if to leeward, must not luff until she has drawn clear ahead of the yacht she has overtaken.

23. *Close-hauled approaching shore.*—If two yachts are standing towards a shore or shoal, or towards any buoy, boat, or vessel, and the yacht to leeward is likely to run aground, or foul of such buoy, boat, or vessel (a mark-vessel excepted), and is not able to tack without coming into collision with the yacht to windward, the latter shall at once tack, on being hailed to do so by the owner of the leeward yacht, or the person acting as his representative, who shall be bound to see that his own vessel tacks at the same time.

24. *Running aground, etc.*—Any yacht running on shore, or foul of a buoy, vessel, or other obstruction, may use her own anchors, boats, warps, etc., to get off, but may not receive any assistance except from the crew of the vessel fouled. Any anchor, boat, or warp used must be taken on board again before she continues the race.

25. *Fouling yachts, marks, etc.*—Each yacht must go fairly round the course; and must not touch any buoy, boat, or vessel used to mark it out, but shall not be disqualified if wrongfully compelled to do so by another yacht. Any yacht causing a mark-vessel to in any way shift her position to avoid being fouled by such yacht, shall be disqualified. If a yacht, in consequence of her neglect of any of these rules, shall foul another yacht, or compel other yachts to foul, she shall forfeit all claim to the prize, and shall pay all damages.

26. *Means of propulsion.*—No towing, sweeping, poling, or pushing, or any mode of propulsion except sails, shall be allowed.

27. *Anchoring.*—A yacht may anchor during a race, but must weigh her anchor again, and not slip. No yacht shall during a race make fast to any buoy, stage, or pier, or send an anchor out in a boat, except for the purpose of Rule 24.

28. *Sounding.*—No other means of sounding than the lead and line allowed.

29. *Side-lights.*—All yachts sailing in a race at night shall observe the Board of Trade rule as to the carrying of side-lights.

30. *Man overboard.*—In case of a man falling overboard from a competing yacht, all other yachts in a position to do so shall use their utmost endeavors to render assistance; and if it should appear that any yacht was thereby prevented winning the race, the committee shall have power to order it to be re-sailed between

any yacht or yachts so prevented and the actual winner.

31. *Protests.*—Should the owner of any yacht, or the person acting as his representative, consider that he has a fair ground of complaint against another for foul sailing, or any violation of these rules, he must, if it arise during the race, signify the same on first passing the committee vessel, by showing an ensign conspicuously in the main rigging. The protest shall be made in writing, and under such regulations (if any) as the sailing committee may have determined, within 12 hours of the arrival of the protesting yacht, and shall be heard by the sailing committee and decided, after such inquiries as they may consider necessary. They shall also, without a protest, disqualify any yacht, should it come to their knowledge that she has committed a breach of the rules.

32. *Removal of flag-boat.*—Should any flag-vessel or other mark be removed from its proper position, either by accident or design, the race shall be sailed over again, or not, at the discretion of the sailing committee.

33. *Penalty for disobeying rules.*—Any yacht disobeying or infringing any of these rules, which shall apply to all yachts whether sailing in the same or different races, shall be disqualified from receiving any prize she would otherwise have won, and her owner shall be liable for all damages arising therefrom.

Should a flagrant breach of these rules be proved against any yacht, her sailing-master may be disqualified by the council for one season from sailing in any race held under the Rules of the Yacht-Racing Association.

34. *Cruising trim.*—When yachts are ordered to sail in cruising trim, the following rules are to be strictly observed ;

1. No doors, tables, cabin skylights, or other cabin or deck fittings (davits excepted) shall be removed from their places before or during the race.

2. No sails or other gear shall be put into the main cabin in yachts exceeding 40 tons.

3. Anchors and chains suitable to the size of the yacht shall be carried, one at the cat-head (or in yachts of 40 tons and under, at the usual place on the bow), which anchor shall not be unshackled from the chain before or during the race.

4. Every yacht exceeding 30 and under 70 tons, shall carry a boat on deck not less than 10 feet in length and 3 feet 6 inches beam,—a yacht of 70 tons and over, her usual cutter and dinghey.

5. No extra hands, except a pilot, beyond the regular crew of the yacht, shall be allowed.

APPENDIX.

The Yacht-Racing Association further recommends for the consideration of sailing committees:

1st. *Allowance to schooners and yawls.*—That as mixed races are no satisfactory test of the relative speed of yachts, the different rigs should, whenever practicable, be kept separate; but when mixed races are unavoidable, the following rule shall be observed :

The tonnage of schooners and yawls to be reckoned for time allowance as follows, viz., schooners at three-fifths, and yawls at four-fifths of their actual tonnage ; provided that in case of a yawl, her main-boom when in its place and parallel to the deck, does not extend more than one-fifth her extreme beam abaft the aft side of her stern-post on deck. In calculating the deduction for difference of rig, the tonnage by certificate to the exact fraction to be used. The time allowances to be calculated from each vessel's reduced tonnage. Schooners and yawls shall not be allowed to enter in classes of 40 tons and under at the reduced tonnage.

2d. *Flying starts.*—That flying starts should be adopted when practicable, but no time should be allowed for delay in starting.

3d. *No limit to race.*—That any limit to the time for concluding a race should be avoided as far as possible.

4th *Classification.*—That the classification of yachts should, when practicable, be as follows :

Not exceeding	5 tons.
Above 5 tons and not exceeding	10 "
" 10 " " "	15 "
" 15 " " "	20 "
" 20 " " "	40 "
" 40 " " "	80 "
" 80 "	

5th. *Courses.*—That as distance is an important element in the calculation of time allowance, the marks and flag-boats should be placed so as to mark as accurately as possible the length of the course, for which time is allowed.

6th. *Rounding marks.*—That in heavy weather it should be arranged, if practicable, for yachts to stay instead of gybe round marks.

7th. *Room at starting.*—Sailing committees should be particularly careful to provide ample room between the points marking the starting-line.

Measurement.—The sole object of measurement and allowing time is to enable yachts of various sizes to compete upon terms of equality. A fair and logical rule must therefore be based upon size. Any rule which places a tax upon model is erroneous in foundation and misleading in its workings. Rules based upon any one or two dimensions, however much they may be the custom, are manifestly not equitable, because they do not tax differences of size, but differences of model in the one or two particular directions measured. They do not tax size because any one or any two dimensions added or multiplied are in no wise an expression of size, nor does such measurement necessarily represent the ratio of size between the vessels gauged. Yachts will shrink in the direction taxed, as witness the short, dumpy American sloop seeking to escape the penalty of length, and the English cutter squeezed into untaxed depth, the designer being restricted to their production against his will. A measurement of actual magnitude is the only mode which satisfies the fundamental proposition from which the reasoning takes its start. A rule taxing the actual size of a vessel does not in the slightest degree tax shape or model ; it taxes quantity only, and not its location. Under such a system the designer is left absolutely free, and can mold a given quantity into any shape he deems most desirable ; he may proportion length, beam, and depth to his taste, and a rival will not be compelled to pay unjustly because he may prefer some other shape, involving an excess in one or two directions without any excess in size. The rule of the New York Yacht Club is the most perfect in theory, and, so far as racing is

concerned, gives the fullest satisfaction. It calls for the measurement of the actual cubical contents of a yacht to the outside of her plank. There exists one objection to it in practical application. It does not admit of quick and ready gauging, nor can a yacht's size be easily verified upon the spot by an owner or a regatta committee. A simplification of the method of arriving at the same results with sufficient accuracy for practice is desirable. To this end a multiplication of all three chief dimensions, length, depth, and breadth, has been adopted with success by some clubs as a short-cut leading to like results. The correctness of this plan is based upon the assumption that the true size of all fast yachts bears so nearly a like proportion to their circumscribed solids that the products of the three extreme dimensions will express the ratio of their sizes to one another with sufficient accuracy for racing purposes. The only danger to be apprehended from a general and permanent adhesion to this rule arises from the probability of cutting down freeboard, and thereby decreasing the depth, and with it the racing size of yachts, whose owners would sail them only in fair weather. A long string of prizes won in midsummer breezes would be a strong inducement for others to follow suit, and one of the most desirable qualities of a cruising boat—ample freeboard—would be sacrificed to the greed for prizes. Should this fear turn out to be well grounded, the tendency can be counteracted by including in the rule of measurement a standard amount of freeboard, which would at once remove the inducement to cripple cruising efficiency in the manner indicated. The rule and allowances of the New York Yacht Club are as follows:

TABLE OF ALLOWANCES

In Minutes and Decimals, by a Yacht measuring Sixteen Thousand Cubic Feet, to Yachts of the Measurements given below.

Cubic Feet.	Allowances.	Cubic Feet.	Allowances.	Cubic Feet.	Allowances.	Cubic Feet.	Allowances.	Cubic Feet.	Allowances.	Cubic Feet.	Allowances.	Cubic Feet.	Allowances.	Cubic Feet.	Allowances.
15.900	.0275	13 900	.7677	11.900	2.0413	9.900	4 2323	7.900	8 0018	5.900	14.4869	3.900	25.6441	1.900	44.8393
15.800	.0558	13.800	.8164	11.800	2.1249	9.800	4.3762	7.800	8.2493	5.800	14.9128	3.800	26 3768	1.800	46.0999
15.700	.0848	13.700	.8663	11.700	2.2108	9.700	4.5240	7.700	8.5037	5.700	15.3504	3.700	27.1297	1.700	47.3951
15.600	.1146	13.600	.9176	11.600	2 2991	9.600	4.6759	7.600	8.7650	5.600	15.8000	3 600	27.9033	1.600	48.7260
15.500	.1453	13.500	.9704	11.500	2.3899	9.500	4.8320	7.500	9.0336	5.500	16.2620	3.500	28.6981	1.500	50.0935
15.400	.1768	13.400	1.0245	11.400	2.4831	9.400	4.9924	7.400	9.3095	5.400	16.7368	3.400	29 5148	1.400	51.4985
15.300	.2091	13.300	1.0802	11.300	2.5789	9.300	5.1572	7.300	9.5930	5.300	17 2245	3.300	30.3540	1.300	52.9423
15.200	.2424	13.200	1 1374	11.200	2.6773	9.200	5.3265	7.200	9.8843	5.200	17.7257	3.200	31.2162	1.200	54.4257
15.100	.2765	13.100	1.1962	11.100	2.7784	9.100	5.5005	7.100	10.1836	5.100	18.2406	3.100	32.1022	1.100	55.9499
15.000	.3117	13.000	1.2566	11.000	2.8823	9.000	5.6793	7.000	10.4912	5 000	18.7698	3.000	33.0125	1.000	57.5160
14.900	.3477	12.900	1.3187	10.900	2 9891	8 900	5.8629	6.900	10.8072	4.900	19.3134	2.900	33.9178	.900	59.1252
14.800	.3848	12.800	1.3824	10.800	3.0988	8.800	6.0517	6.800	11.1319	4.800	19.8720	2.800	34.9089	.800	60.7786
14.700	.4229	12.700	1.4479	10.700	3.2115	8.700	6.2456	6.700	11.4655	4.700	20.4460	2.700	35.8964	.700	62.4775
14.600	.4620	12.600	1.5153	10 600	3.3273	8.600	6.4448	6.600	11.8083	4.600	21.0358	2.600	36.9110	.600	64.2232
14.500	.5022	12.500	1.5844	10.500	3.4463	8.500	6.6496	6.500	12.16[illegible]5	4.500	21.6418	2.500	37 9536	.500	66.0168
14.400	.5435	12.400	1.6555	10.400	3.5686	8.400	6.8599	6.400	12.5225	4.400	22.2644	2.400	39.0248	.400	67.8598
14.300	.5860	12.300	1.7285	10.300	3.6942	8.300	7.0761	6.300	12.8943	4.300	22 904[illegible]	2.300	40.1255	.300	69.7534
14.200	.6296	12.200	1.8036	10.200	3.8233	8.200	7.2982	6.200	13.2764	4.200	23.5616	2.200	41.2564	.200	71.6991
14.100	.6744	12.100	1.8807	10.100	3.9560	8.100	7.5264	6.100	13.6690	4.100	24.2370	2.100	42.4185	.100	73.6984
14.000	.7204	12.000	1.9599	10.000	4.0923	8.000	7.7609	6.000	14.0724	4.000	24.9310	2.000	43.6125		

The water-line of each yacht shall be divided into four equal parts, and a section taken at each point of division, making five sections. The area of each section, from the rabbet-line of the keel to the line of the lowest point of the top of the plank-shear, as described in the rules, shall be measured and determined in square feet, and the cubical contents of the yacht shall then be got by the following formula taken from Chapman's rules for measuring vessels:

To the sum of the areas of the first and last sections add the sum of the areas of the even sections multiplied by 4, and the areas of the odd sections multiplied by 2. Multiply this sum by one-third of the distance between the sections, and add the cubical contents of the overhangs, measured in each case, as shall, from the form of the boat, be most expedient, and the result thus obtained shall, for the purposes of this measurement, be deemed the cubical contents of the yacht.

To find the allowance to a yacht whose measurement comes between any two even hundreds in the tables, deduct from the allowance to the even hundreds next below hers, such proportion of the difference between that allowance and the one next above it in the table as the excess of her measurement over the lower hundred bears to one hundred.—*C. P. Kunhardt, N.A.*

Yarage. The power of moving or being managed at sea; said with reference to a ship.

Yard. A spar suspended from a mast, to which the head of a sail is bent. Stun'sail-yards are suspended from the yard-arms by their halliards. The centre of a yard is called the *slings*, the extremities, the *yard-arms*, and the intermediate parts, the *quarters*. Yards for lateen- and lug-sails have their halliards bent on near the forward end; yards for square-sails are supported at their centres by slings, tyes, or halliards, and at the extremities by lifts. Lower yards are fixed, being attached to the mast by trusses, which permit angular movement only; all other yards are confined to the masts by parrels, which permit a vertical as well as an angular movement of the yards. Yards are hoisted by halliards, and trimmed by braces. *Lower yards* are supported by the lower-masts; *topsail-yards*,

topgallant-yards, and *royal-yards* follow in order, and traverse up and down their respective masts. *Skysail-yards* are sometimes carried, and are placed next above the royals. A *gaff-topsail yard* is a small yard to which the head of a gaff-topsail is sometimes bent.

Yard is also the popular name given to the three stars in Orion's belt. See NAVY-YARD.

YARD-ARM. The extremity of a yard. *Yard-arm and yard-arm*, the situation of ships close alongside each other.

YARD-ARM CLEATS. Wooden wedges nailed to the yard-arm to prevent the lifts and braces from slipping in.

YARD-ROPE. A rope bent to the slings of a yard by which it is swayed aloft or lowered.

YARD-TACKLE. A heavy tackle hooked to lower yards, and used in hoisting heavy articles in or out.

Yare. *Be yare at the helm!* quick with the helm!—an old nautical phrase

Yarmouth, County of Norfolk, England, is situated on a narrow strip of land between the sea and the river Yare. The quay, considered one of the finest in Britain, extends along the river for about 1 mile. On the coast are several batteries and barracks for 1000 men. The harbor is in the Yare, and is accessible by vessels of about 200 tons, and the navigation of the coast is dangerous, but Yarmouth Roads, which extend between the coast and a line of sand-banks a short distance off shore, are a safe anchorage. Ship-building is carried on, and it has a manufactory of silk goods, but the principal industry is the herring-fishery, and as much as 9000 tons of fish have been shipped from here in a year. Pop. 35,000.

YARMOUTH CAPON. A red herring; a bloater.

YARMOUTH HERRING-BOAT. A clinch-built boat with lug-sails, used in the herring-fishery.

Yarn. A rope-yarn. A tale; a story. *To spin a yarn*, to relate a story.

Yaugh. An old term for a small yacht.

Yaw. To deviate from the course. Yawing is caused by a heavy sea under the quarter, by bad steering, or by an injudicious arrangement of the sails.

YAW-SIGHTED. Squint-eyed.

Yawl. A small fishing-vessel. A carvel-built vessel of the cutter class with a jigger and short main-boom. An English man-of-war's boat, carvel-built, and pulling generally 12 oars.

Yaw-yaws. A nickname for seamen from the Baltic.

Year. The period in which the earth completes a revolution in her orbit. Some point must be taken to mark the origin whence the revolution is reckoned; if a fixed star be taken, the period is called a *sidereal* year ($365^d\ 6^h\ 9^m\ 9.6^s$); if the first point of Aries, the period is known as the *solar*, *equinoctial*, or *tropical* year ($365^d\ 5^h\ 48^m\ 49.7^s$). The *anomalistic* year is the period between two successive returns of the earth to perihelion. The *civil* year consists of an integral number of days,—a common of 365 and leap-year of 366 days. See CALENDAR.

Yell. An old sea-term to express a rolling motion.

Yellow Admiral (*Eng.*). A retired post-captain who, not having served his time in that rank, is not entitled to promotion.

Yellow-belly. A dago; a mulatto.

Yellow Fever (*Typhus icterodes*, *fièvre jaune*, *fiebre amarilla*, *gelbesfieber*, *mal de Siam*, *etc.*). An acute, specific, infectious disease, of a single paroxysm and remarkable malignancy, originating on the coasts and included islands of the great intercontinental gulf of the western hemisphere, as does cholera in those of the Indo-Chinese gulf. Like cholera also, it spreads from its region of origin (the "yellow fever zone"), following the paths of commerce, into other parts of the world, but never becomes naturalized (endemic) outside of its geographical habitat. It is limited to the neighborhood of the sea, and to elevations not exceeding 2500 feet. For its continued activity are required a temperature not below 72° F., a humid atmosphere, the presence of its specific cause and of decomposing organic matter, and, probably, a peculiar but unknown meteorological condition (perhaps, as suggested by Dr. Findlay, of Havana, a highly alkaline atmosphere).

Yellow fever is mentioned as attacking the Spanish *conquistadores*, at San Domingo, in 1494; and is first recorded at Porto Rico in 1508, Darien in 1514, Guadaloupe in 1635, Martinique in 1641, Havana in 1761, etc. It was introduced into Rio de Janeiro and the west coast of South America about 1849, by the stream of travel attracted to California at the time of the gold excitement, and, like many an exotic plant, has often flourished more vigorously in its new than in its old home. The name *mal de Siam* originates from its supposed introduction into Martinique from that country by the "Oriflamme," in 1690. The "Oriflamme" did not, however, come directly from Siam, and yellow fever had certainly appeared in Martinique as early as 1641. Increased commerce has facilitated the dissemination of the yellow fever poison, which is as portable as merchandise, until there is now scarcely a port within its climatic limits which has not suffered from one or more epidemics. Notable examples are the epidemics at Philadelphia in 1793, Gibraltar in 1828, New Orleans in 1853, and Memphis in 1878–79, which are considered as epochs in the history of yellow fever, from the fact that each has been reported upon by observers of remarkable trustworthiness (Drs. Benj. Rush, Simon, E. H. Barton, and the National Board of Health). The importance of yellow fever from a military stand-point attaches rather to the navy than to the army, since soldiers can always be moved from an unhealthy locality and segregated from sources of infection. Its terrors are immeasurably augmented when they invade the inhabitants of a ship at sea, where the sick cannot be separated from the well, and all possibility of escape by flight is cut off, while close crowding affords great facilities to its increase. An early instance in the history of the U. S. navy was the ship "Gen. Green," in which yellow fever appeared while making a voyage from Newport to Havana, in 1799, and, notwithstanding efforts at disinfection at the mouth of the Chesapeake on her homeward voyage, reappeared at sea, and continued to spread while she lay at Newport, attacking even those who bathed near the ship. The "Macedonian" suffered from yellow fever at Havana, in May, 1822, so severely, that she returned to Norfolk in July, and was put out of commission. Of 376 persons on board, 101 died in this short time.

Yellow fever appeared on board of the British steamer "Éclair," at Sierra Leone, in 1845, whence she sailed to Boa Vista. There the disease spread rapidly, although the crew was landed on an island, and of 4 officers from the "Growler," who visited the empty ship as a board of survey, 3 had yellow fever. She returned to England in September, having 41 cases at sea. The pilot who boarded her was attacked. In 1847, after having been cleansed and disinfected, the "Éclair" sailed for the Cape of Good Hope, but was obliged to put in at Ascension with yellow fever again on board. The "Susquehanna" suffered from yellow fever at Grey Town in 1856, and landed 200 cases at Jamaica and New York. She was repeatedly broken out, cleansed, and exposed to a freezing temperature, to be finally abandoned as incorrigibly infected. The "Plymouth" had a return of yellow fever in the spring of 1879, before touching at any port, after having been broken out, disinfected, and exposed to the low temperature of Boston during most of the preceding winter. At this writing (May, 1880) the "Marion" is reported at Montevideo, with yellow fever on board, undergoing disinfection. Of late years the ports of Havana, Rio de Janeiro, and St. Thomas have most frequently been credited with being the sources of yellow fever epidemics, the two latter, in particular, so far as men-of-war are concerned. Severe naval epidemics have also occurred at the navy-yard, Pensacola, and at Key West.

Yellow fever is characterized by a period of incubation seldom exceeding 5 days, a sudden and prostrating onset, with high body temperature (105°–107° F.), flushed face, suffusion of the eyes, and albuminous urine, deficient in chlorides. To the paroxysm, which lasts from 24 to 48 hours, succeeds a "stage of calm," during which the fever subsides, hemorrhages occur from the nose, gums, stomach (black vomit), and intestines (tarry stools), and a yellow tint colors the whole surface, deepening during convalescence or after death. Renewal of fever, or a sudden rise in body temperature, indicate a fatal termination, which generally occurs between the fourth and seventh day. After death there is a notable rise in the body temperature (to 106° F.), which lasts for 12 hours, putrefaction progresses rapidly, and an odor, said to be peculiar to the disease, is developed. The blood is found to be thin, fluid, of acid reaction, with its white corpuscles increased in number and undergoing fatty degeneration. It is said to contain a great excess of urea (Dr. Joseph Jones, of New Orleans). The liver is also subject to fatty degeneration, and presents a fawn-yellow color. Lesions have been observed in the kidneys, spleen, and nervous system, but are not invariably characteristic of this disease. No peculiar organism has yet been discovered in the blood of yellow fever patients where proper precautions against its artificial introduction have been observed. When death does not occur, convalescence is tedious, and likely to be interrupted by changes of weather or slight imprudence, the blood having become profoundly impaired as to its nutritive functions during the paroxysm. There is no drug which has been proved to be a specific cure, the most successful treatment confining itself to hygienic measures, fluid diet, promotion of perspiration, and a free use of ice.

The *cause* of yellow fever has not yet been discovered. It is, however, known to be portable and specific (reproducing its like and no other disease), is almost certainly material, and is very probably either a living organism or a substance resulting therefrom (as alcohol, acetic and lactic acids result from the growth of fungi and bacteria). It is capable of lying dormant indefinitely under a low temperature and unfavorable conditions, to revive when congenial surroundings are restored. In this regard it suggests a parallel with the passive forms of many fungi. Decomposing organic matter, coal, and especially decaying sea-weed and rotten wood, favor its development, wood affected with dry rot (see DRY ROT) appearing to afford peculiar facilities to its preservation in a dormant state.

Prevention should include such construction as will obstruct the development of dry rot and afford no inaccessible recesses in a ship, cleanliness, ventilation, anchorage at a distance from shore, and a rigid observance of sanitary regulations relating to intercourse with the shore, clothing, food, hours of labor, and fresh-water supply.

Disinfection by chemicals, such as carbolic acid, chlorine, sulphate of iron, etc., has not proved satisfactory, the foul odors which these agents destroy having no necessary connection with yellow fever. Exposure to a low temperature causes the disease to cease for the time, but has not always prevented its later recurrence, as in the cases of the "Susquehanna" and "Plymouth," and experiments upon low organisms found to be connected with other diseases have shown that their vitality is not destroyed even by so low a temperature as —10° F. Live steam was injected into the holds of the "Don" (at Santa Cruz) and "Mahaska" (at New Orleans) in 1867, with success, the vessels remaining on the station without any return of the disease. Sulphurous acid gas and air at a temperature exceeding 260° F. have been found to be alike fatal to all living organisms, and a naval board ordered to investigate the subject, has this year (1880) recommended the use of this gas, superheated, in the holds of infected vessels. (Aitken's "Practice of Medicine," art. Yellow Fever; Ziemssen's "Cyclopædia;" "La fièvre jaune à la Martinique," par L. B. Berenger Féraud, M.D., Paris, 1878; "Naval Medical Essays," Bureau of Medicine and Surgery, Washington, 1873–75–79; "Preliminary Report of the Havana Yellow Fever Commission," Supp. National Board of Health Bulletin, November, 1879; Dr. A. Stillé, *Medical Record*, N. Y., March 1, 1879; "Disinfectants," G. W. Sternberg, Surgeon U.S.A., National Board of Health Bulletin, January 17, 1880; "Pathological Histology of Yellow Fever," Surgeon J. J. Woodward, U.S.A., 4th Supplement do.; Surgeon J. S. Billings, U.S.A., in *Contemporary Review*, January, 1880, etc.)—*J. H. Kidder*, *Surgeon U.S.N.*

Yellowing (*Eng.*). The overslaughing of captains in a flag-promotion.

Yellow Jack. Yellow fever. The quarantine flag.

Yellow Tail. A well-known tropical fish, often in company with whip-rays; it is about 4 feet long, with a great head, large eyes, and many fins.

Yeo-heave-yeo! The chant of merchant sailors in hauling and heaving.

Yeoman. An appointed officer who has charge of stores and keeps the accounts in his special department; as, ship's yeoman, paymaster's yeoman, engineer's yeoman.

Yoke. An athwartship piece of wood or metal fitted over the head of a boat's rudder, and serving as a substitute for a tiller.

YOKE-LINES. Lines from each extremity of a yoke and extending to the stern-sheets, and used in steering a boat.

Young Gentlemen. A general designation for midshipmen.

Young Ice. Ice recently formed.

Youngsters. A general term for young officers, or men. See OLDSTER.

Young Wind. The commencement of the land- or sea-breeze.

Yow-yow. A small Chinese sampan.

Z.

Z. In the log-book, *z* denotes *haze*.

Zambo. A sobriquet on the Spanish Main for a race produced by the union of the negro and the Indian; it literally means bow-legged.

Zenith. The superior pole of the celestial horizon; the point of the heavens directly overhead.

ZENITH-DISTANCE. The angular distance of a heavenly body from the zenith; the complement of the altitude.

Zephyr. The west wind. A gentle breeze.

Zero. The point from which the marks on a graduated scale are numbered, the marks progressing in one direction being read *plus*, and those in the contrary direction *minus*. A zero as a point of reference may be established arbitrarily. The *absolute zero* of temperature, the most convenient base for scientific computations, as computed from the apparent law of expansion of a perfect gas, is 461.2 degrees below the zero of Fahrenheit.

Zodiac (Gr., from *zōdion*, the diminutive of *zōon*, an animal). That region of the heavens within which the apparent motions of the sun, moon, and the most conspicuous of the planets are confined. The apparent paths of the moon and all the known planets were found to be spiral curves of more or less complexity, and described with very unequal velocities in their different parts. These bodies were observed, however, to have this in common, that the general direction of their motions is the same with that of the sun, viz., from west to east, contrary to that in which both they and the stars appear to be carried by the diurnal motion of the heavens; and, moreover, that they cross and recross the ecliptic at regular and equal intervals of time, never deviating from the ecliptic on either side more than 8° or 9°. It is this zone of about 17° broad, having the ecliptic running along its middle, which was named the zodiac. Before the discovery of the asteroids, the zodiac restricted to the above limits formed the zone of the moving bodies of the heavens. But the orbits of many of the asteroids have a very considerable inclination to the ecliptic,—Pallas nearly 35°, so that the significance of the zone of the zodiac is now, except in the most general sense, all but obsolete. The term zodiac is derived from the constellations of this zone being anciently figured as "animals." Its circuit was divided into 12 equal parts, the "sign" or symbol of each being taken from the constellation with which it then coincided. They are as follows:

NORTHERN SIGNS.

♈ *Aries*, the Ram.	♋ *Cancer*, the Crab.
♉ *Taurus*, the Bull.	♌ *Leo*, the Lion.
♊ *Gemini*, the Twins.	♍ *Virgo*, the Virgin.

SOUTHERN SIGNS.

♎ *Libra*, the Balance.	♑ *Capricornus*, the Goat.
♏ *Scorpio*, the Scorpion.	♒ *Aquarius*, the Water-bearer.
♐ *Sagittarius*, the Archer.	♓ *Pisces*, the Fishes.

These constellations, however, do not cover the same parts of the ecliptic they formerly did, in consequence of the retrograde motion of the first point of Aries along the ecliptic, from which its divisions are reckoned. Hence the necessity of distinguishing between the *signs* of the ecliptic or zodiac and the *constellations* of the zodiac, the former being purely technical subdivisions of ecliptic of 30° each, commencing from the first point of Aries.

ZODIACAL LIGHT. A cone of faint light apparently proceeding from the rising or the setting sun; it is most commonly seen in the tropics.

Zoel, or Saul. A timber much used in the construction of the vessels of India.

Zone (Gr. *zōnē*, a belt). In consequence of the obliquity of the ecliptic, the earth's surface is naturally divided into 5 zones. The *torrid* zone embraces the region situated between the parallels 23° 28′ N., and 23° 28′ S.; at some season of the year the sun will be in the zenith of each point of this region. The *temperate* zones extend from the torrid zone to the parallels 66° 32′ N., and 66° 32′ S.; the sun is seen to rise every day, and it is never in the zenith of any point of these zones. The *frigid* zones extend from the poles to the temperate zones; at some time during the year the sun will be below the horizon for more than 24 hours, and at another time it will be above the horizon for more than 24 hours, the length of this time depending upon the proximity of the point to the pole.

Zopissa. Tar or pitch scraped off the bottoms of old ships, and thought to be good for ulcers. Also, a highly preservative varnish in use by the ancients for ship's bottoms, sarcophagi, etc.

Zuben el Chamali. *β Libræ.*

Zuben el Genubi. *α Libræ.*

Zuhn. A species of rush from which inferior canvas and cordage is made, in the East.

Zumbra. A small Spanish row-boat.